In Pursuit of Excellence	Course and Faculty Details	SESSION-2019-2020
		SEM-5th

Faculty Details

Name of the Faculty: Deepak Singh

Designation: Assistant P

In Pursuit of Excellence	ASSIGNMENT - 8	SESSION-2019-2020
		SEM-5th

Home Assignment

Unit 4[CO- 4]

1. What are super charging limits for SI and CI engines What are the objectives of supercha
2. Describe the operation of water cooling system used in IC engine with schematic arrange
3. Describe any one type of supercharging arrangements for IC engine and its application.
4. Sketch and explain working principle of a typical thermostat used in engine cooling syst
5. Why engine cooling is necessary.
6. Write down the physical characteristics of lubricating oil

Deepak (DEEPAK SINGH)
Name & Sign. of Faculty

Sign. of Reviewer

Sign. of HO

Dr. Munish

Vision of Institute

To develop industry ready professionals with values and ethics for global needs

Mission of Institute

M1: To impart education through outcome based pedagogic principles.

M2: To provide conducive environment for personality development, training and entrepreneurial skills.

M3: To induct high professional ethics and accountability towards society in students.

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Vision of Department

To develop competent and skilled Mechanical Engineers having moral values and ethics for the fulfilment of fast changing global needs.

Mission of the Department

- To nurture continuous enhancement in teaching learning process for imparting strong fundamental knowledge of core, engineering science, and interdisciplinary subjects to students.
- To provide state-of-the-art laboratories for providing hand-on experience of technology, and to provide platforms for leadership and overall personality development.
- To develop strong mentor-mentee relationship for the professional and personal growth of students and also to inculcate moral values and ethics for serving the society.

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Program Education Objectives

The objectives of the Department of Mechanical Engineering are to produce graduates who will have the:

- Employability skills for making career in industries, academia, government services and as an entrepreneur.
- Potential to apply fundamental concepts of mechanical engineering, engineering science and practical training in solving mechanical engineering problems and to contribute in development of technologies.
- Skills to apply leadership, managerial and administrative qualities to lead the projects professionally and ethically.

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Program Outcomes

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling to complex engineering activities, with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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Mechanical Engineering graduates will be able to:

- Identify and solve problems of thermal engineering, strength of materials, fluid mechanics, refrigeration & air conditioning, design, dynamics of machines, mathematics and engineering science.
- Get fundamental knowledge and hand-on experience of different manufacturing processes, material testing techniques and CAD/CAM tooling to apply in various industries.
- Learn quality and industrial management concepts, communication and soft skills along with other interdisciplinary subjects such as programming language, electrical engineering and basic electronics to enhance their employability.

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Moradabad Institute of Technology

Ramganga Vihar Phase – II, Moradabad

ACADEMIC CALENDAR

ODD Semester — Session: 2019 – 2020

S. No.	Particulars	Date	Responsibility
1.	**Time Table** (a) Display on Notice Boards (b) Distribution to concerned Teachers	29 July 2019 29 July 2019	O.C. Time – Table
2.	Distribution of class lists to teachers	29 July 2019	O.C. Class / DR
3.	**Registrations** (a) 3rd / 5th /7th Semester (b)List of unregistered students to various department (c) Notifying unregistered students for getting registered at the earliest (through class O.Cs, / Faculty)	1,2,3 Aug.2019 20 Aug 2019 22 Aug 2019	Concerned Teachers OS Academic Concerned HODs
4.	**Commencement of Classes** 3rd / 5th / 7th Semester	2,3,4 Aug.2019	Concerned Teachers
5.	Blow up submission to HODs	30 July 2019	Concerned Teachers
6.	Announcement of Test series dates	16Aug 2019	Dean Academics
7.	(a) Collection of Examination forms from University and announcement of date for availability of forms (b) Last date for submission of forms to office (c) Submission of forms to University	30 Aug 2019**	OS Academic to take timely action as per University directions.
8.	Procurement of stationary & materials for Test Series for full semester (a) Requirement (b) Actual Procurement	31 Aug 2019 5 Sept 2019	Convener Test Series Committee O.S. Academics
9.	(a)Short attendance compilation and information to parents and undertaking format handed over to students (b)Collection of Short attendance undertaking	09 Sept 2019 11 Sept 2019	O.C. Class
10.	1st Test Series — Thu, Fri, Sat	12, 13,14, Sept 2019	
	(a) Announcement of Test Series schedule, Invigilation Programme, Seating arrangement etc.	11 Sept 2019	Class Test Committee
	(b) After completion of Test Series- Evaluation of test copies & showing of copies to students	21 Sept 2019	Concerned Teachers
	(c) Submission of test copies in Nodal Centre	25 Sept 2019	Concerned Teachers
	(d) Report of poor performance of students to class OCs	26 Sept 2019	Concerned Teachers
	(e)Short attendance compilation, display on notice board and information to parents	19 Oct 2019	O.C. Class
11.	2nd Test Series — Wed, Thus, Fri	23,24, 25 Oct 2019	
	(a) Announcement of Test Series schedule, Invigilation Programme, seating arrangement etc	22 Oct 2019	Class Test Committee

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	(b) After completion of Test Series - Evaluation of test copies & showing of copies to students	02 Nov 2019	Concerned Teachers
	(c) Submission of test copies in Nodal Centre	04 Nov 2019	Concerned Teachers
	(d) Report of poor performance of students to class OCs	05 Nov 2019	Concerned Teachers
12.	Filling of student feedback forms for current semester	27 Nov 2019	Concerned HODs
13.	Requirement of additional Faculty (to be conveyed to Director) (for even semester)	30 Nov 2019	Concerned HODs
14.	(a) Floating the electives for even semester	26 Nov 2019	Concerned HODs
	(b) Last date for students choice	30 Nov 2019	
15.	Announcement of dues list and its last date for clearing dues (Current semester)	**22 Oct 2019**	Accounts/ OS Academic
16.	Date up to which final attendance is to be counted	29 Nov 2019	Concerned teachers
17.	Submission of consolidated list of shortage of attendance to Director and information to Parents	30 Nov 2019	Class O.Cs
18.	**3rd Test Series Thu, Fri, Sat**	**28,29,30 Nov 2019**	
	(a) Announcement of Test Series schedule, Invigilation Programme, Seating arrangement etc.	27 Nov 2019	Class Test Committee
	(b) After completion of Test Series- Evaluation of test copies & showing of copies to students	03 Dec2019	Concerned Teacher
	(c) Submission of test copies in Nodal Centre	04 Dec 2019	Concerned Teachers
	(d) Report of poor performance of students to class OCs	04 Dec 2019	Concerned Teachers
19.	**Submission of sessional marks:** (a) Meeting of Dean Academics, , all HODs and Director regarding attendance and performance of students.	04 Dec 2019	Dean Academics
	(b) Checking of Teachers' Records by HODs	05 Dec 2019	Concerned HODs
	(c) Finalization of sessional marks	05 Dec 2019	Concerned Teachers
	(d) Submission of Award list after final checking and uploading to OS Academics for further necessary action	As per date announced by AKTU	HODs Concerned Teachers
20.	**Theory Examinations:** (a) Collection of Admit Cards / Roll Nos. from University (b) Preparation of Roll lists (c) Collection of stationery such as copies, practical copies drawing sheets, graph paper etc. from University. (c) Procurement of stationery and other materials locally as necessary.	As per AKTU schedule	OS Academics to take appropriate actions as per University directions.
21.	**Practical Examinations:**	As per AKTU schedule	Concerned HODs
	(a) Appointment of Internal Examiners	3 days before the practical exam schedule	Concerned HODs
	(b) Obtaining list of panel of External Examiners from AKTU & preparation of schedule of practical examination.	As per AKTU schedule	OS Academics
	(d) Dispatch of letters/contacting the external examiners	Within 2 days of list obtained from AKTU	HODs and concerned teachers

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22.	**Preparation for Even Semester** (a) Load Distribution by Department (b) Submission to O.C. Time-Table (c) Display of Time Table on Notice Board	10 Dec 2019 12 Dec 2019 18 Jan 2020	Concerned Coordinators O.C. Time Table
23.	Registration for Even semester [2019 – 20]	To be announced**	OS Academic
24.	Announcement of Academic calendar for Even semester [2019 – 20]	5 Days before the start of Even sem.	Dean Academics

****May be revised as per AKTU Schedule.**

Nitin Sl 27.7.2019

Dean Academics

Director

Copy to:

1. Chairman	2. Secretary	3. P.A. to Director for Director's folder
4. All HODs	5. DOSW for- 29/7	6. Controller Examination for
7. Associate Dean Academics	8. Registrar for 29/7/19	9. All Faculty Members through HODs
10. O.S. Academics	11. A.S. Examinations	12. Accounts Section
13. T & P Cell 29-7-19	14. Librarian	15. Convener Test Series/ O.C. Time Table

for 27/07/19

~~for A~~ to 29/7/19

for Incharge 29/7/19

for Dy 29/07/19

for- ASH 29/7

for Dy 29/07/19

for 29.07.19

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STUDY AND EVALUATION SCHEME

B-Tech. Mechanical Engineering

YEAR: 3rd / SEMESTER-V

S. No.	Subject Code	Subject Name	Department	L-T-P	Theory / Lab Marks	SESSIONAL		Total	Credit
						Test	Assignment / Attendance		
1	RAS501	Managerial Economics	Applied Science	3--0--0	70	20	10	100	3
2	RAS502/ RUC501	Sociology /Cyber Security	Applied Science	3--0--0	70	20	10	100	3
3	RME501	Machine Design-I	Core Deptt.	3--0--0	70	20	10	100	3
4	RME502	Heat & Mass Transfer	Core Deptt.	3--1--0	70	20	10	100	4
5	RME503	Manufacturing Science& Technology-II	Core Deptt.	3--0--0	70	20	10	100	3
6	RME051-054	Deptt. Elective Course-1	Core Deptt.	3--1--0	70	20	10	100	4
7	RME551	Design and Simulation Lab I	Core Deptt.	0--0--2	50		50	100	1
8	RME552	Heat & Mass Transfer Lab	Core Deptt.	0--0--2	50		50	100	1
9	RME553	Manufacturing Technology-II Lab	Core Deptt.	0--0--2	50		50	100	1
10	RME559	Seminar – I		0--0--2	50		50	100	1
TOTAL								1000	24

DEPTT ELECTIVE COURSE-1

1. **RME-051 IC Engines and Compressors**
2. **RME-052 Mechatronics and Microprocessor**
3. **RME-053 Finite Element Methods**
4. **RME-054 Engineering Optimization**

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Syllabus

Unit-1

Introduction to I.C Engines: Engine classification and basic terminology, Two and four stroke engines, SI and CI engines, Valve timing diagram.

Thermodynamic analysis of Air standard cycles, Otto cycle, Diesel cycle, Dual cycle, Stirling cycle, Ericsson cycles, Comparison of Otto, Diesel and Dual cycles

Fuel air cycle, factors affecting the fuel air cycle, Actual cycle

Unit–II

SI Engines: Combustion in SI engine, Flame speed, Ignition delay, Abnormal combustion and it's control, combustion chamber design for SI engines.

Carburetion, Mixture requirements, Carburetors and fuel injection system in SI Engine

Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition, Scavenging in 2 Stroke engines, Supercharging and its effect

Unit–III

CI Engine: Combustion in CI engines, Ignition delay, Knock and it's control, Combustion chamber design of CI engines.

Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings

*Exhaust emissions from SI engine and CI engine and it's control

Unit-IV

Engine Cooling and Lubrication: Different cooling systems, Radiators and cooling fans, Engine Friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation.

Fuels: Fuels for SI and CI engine , Important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative Fuels for IC engines

Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines

Unit V

Compressors: Classification, Reciprocating compressors, Single and Multi stage compressors, Intercooling, Volumetric efficiency.

Rotary compressors, Classification, Centrifugal compressor , Axial compressors, Surging and stalling, Roots blower, Vaned compressor.

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Syllabus

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CI Engine: Combustion in CI engines, Ignition delay, Knock and it's control, Combustion chamber design of CI engines.

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Exhaust emissions from SI engine and CI engine and it's control

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Compressors: Classification, Reciprocating compressors, Single and Multi stage compressors, Intercooling, Volumetric efficiency.

Rotary compressors, Classification, Centrifugal compressor , Axial compressors, Surging and stalling, Roots blower, Vaned compressor.

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In Pursuit of Excellence	**Course Outcomes**	SESSION-2019-2020
		SEM-5th

COURSE OUTCOMES (May be3 -5)

Once the student has successfully completed this course, he/she will be able:

RME051.1	Students will demonstrate knowledge of the operating characteristics of common IC engines.Students will demonstrate the ability to perform a thermodynamic analysis of Otto, Diesel, and Dual cycle models.
RME051.2	Understand the fuel supply and the ignition systems.
RME051.3	Analyze different electronic fuel injection system, supercharging and its effect on performance of SI and CI engine.
RME051.4	Specify and interpret data of alternative fuels and its emission which effect the environment. To teach students methods to mitigate engine cooling and friction
RME051.5	Students will demonstrate knowledge of the operating characteristics of different type of compressor.

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In Pursuit of Excellence	**Course Delivery Method**	SESSION-2019-2020
		SEM-5th

Name of Subject: IC Engine & Compressor Subject Code: RME-051

Branch: Mechanical Engineering

Course Plan

Delivery Methods: Chalk & Talk, Power Point Presentation, Tutorials, Video Lectures, Analogy, solving Numericals /Design exercises, assignments, seminar, Brainstorming, Group Discussion/Interactive session, Delivery through Simulation Software/CAD Tools, Mini Project, Quiz

Coverage of

Unit 1 by: - Chalk & Talk, Power Point Presentation, Tutorials, Video Lectures, solving numerical, assignments,

Unit 2 by: - Chalk & Talk, Power Point Presentation, Tutorials,

Unit 3 by: - Chalk & Talk, Tutorials, solving Numerical/, assignments.

Unit 4 by: - Chalk & Talk, Tutorials,

Unit 5 by: - Chalk & Talk, Tutorials, solving Numerical/

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Course Name	IC Engine and Compressors
Course Code	RME051
Batch	2017 2021
Semester	5
Session	2019 2020
L:T:P	3.1.0

CO-PO Mapping

Course Code	CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
RME051	CO1	RME051.1	2		1	1	3				1	1	1	1
	CO2	RME051.2	3	3	3	3	3				3	2	1	2
	CO3	RME051.3	3	3	3	3	3				3	2	2	2
	CO4	RME051.4	2	2	2	2	3	1			3	2	2	3
	CO5	RME051.5	3	3	3	3	3	2			3	1	1	2
Mapping Strength		RME051	2.6	2.75	2.4	2.4	3	1.5			2.6	1.6	1.4	2

CO-PSO Mapping

Course Code	CO		PSO1	PSO2	PSO3
RME051	CO1	RME051.1	2	3	2
	CO2	RME051.2	3	3	0
	CO3	RME051.3	3	3	0
	CO4	RME051.4	3	3	2
	CO5	RME051.5	3	3	2
Mapping Strength		RME051	2.8	3	1.2

	Course Exit Survey				
	Q1	Q2	Q3	Q4	Q5
Marks	25	25	25	25	25
CO1	Y	Y	Y	Y	Y
CO2	Y	Y	Y	Y	Y
CO3	Y	Y	Y	Y	Y
CO4	Y	Y	Y	Y	Y
CO5	Y	Y	Y	Y	Y

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MORADABAD INSTITUTE OF TECHNOLOGY, MORADABAD
MECHANICAL ENGG. DEPARTMENT, FACULTY TIME TABLE -2019-20 (ODD SEMESTER)
w.e.f. – 02/08/2019

FACULTY NAME –MR. DEEPAK SINGH (DSG)

L	T	P
7	2	8 = 17 HRS

TIME / DAY	9.00-10.00 am	10.00-11.00am	11.00 - 12.00 Noon	12.00-01.00pm	01.00-2.00pm	2.00-3.00pm	3.00-4.00pm	4.00-5.00pm
MON					L		**5.GV.03(L) B.VOC 1ST A B-303**	
TUE	RME 051 (T) 5TH IC-1 D-303		**5.GV.03(L) B.VOC 1ST A B-303**	RME 051 (L) 5TH E, D-403	U	← Student Interactive session →		
WED	RME 051 (T) 5TH IC-2 D-303			RME 051 (L) 5TH E, D-303	N			
THU			**5.GV.03(L) B.VOC 1ST A B-303**	RME 051 (L) 5TH E, D-306	C			
FRI	KWS 101 (P), 1ST B2, G-102					**5.GV.03(L) B.VOC 1ST A B-303**		
SAT	KWS 101 (P), 1ST C2, G-102				H	← Student Interactive session →		

Subject Code	Subject Name
RME 051	IC ENGINE AND COMPRESSOR
KWS 101 (P)	WORKSHOP LAB
5.GV.03	***Two and Three Wheeler***

31/7/19

(Atul Sharma)
(Deptt. Coordinator Time-Table)

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31/07/19

(Rakesh Kumar Gangwar)
(O.C.Time-Table)

In Pursuit of Excellence	**Time Table**	SESSION-2019-2020
		SEM-5th

Day	I	II	III	IV	V	VI	VII
MON							
TUE							
WED							
THU							
FRI							
SAT							

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In Pursuit of Excellence	**Lecture Plan & Course Coverage**	SESSION-2019-2020 SEM-5th

Total Period: 40

Sr. No.	No. of Periods	Topics/Sub Topics	Reference Books	CO Covered	Planned Date	Coverage Date	Sign
1.	1	Introduction to Course Educational Objective, Course Outcomes, Scheme, Adopted Syllabus, PEOs, POs,PSOs Pre-requisite, Vision & Mission of Institute and Department			06/08/19	06/08/19	Deepan
2.	1	Introduction to I.C Engines: Engine classification and basic terminology.	[1]	CO1	06/08/19	06/08/19	Deepan
3.	2	Two and four stroke engines, SI and CI engines, Valve timing diagram.	[1,3]	CO2	07/08/19 08/08/19	07/08/19 08/08/19	Deepan
4.	1	Thermodynamic analysis of Air standard cycles, Otto cycle.	[1]	CO1	08/08/19	08/08/19	Deepan
5.	1	Diesel cycle, Dual cycle, Stirling cycle, Ericsson cycles.	[1]	CO1	14/08/19	14/08/19	Deepan
6.	1	Comparison of Otto, Diesel and Dual cycles.	[1]	CO1	22/08/19	22/08/19	Deepan
7.	2	Fuel air cycle, factors affecting the fuel air cycle. Actual cycle.	[1]	CO1	22/08/19 27/08/19	22/08/19 27/08/19	Deepan
8.	1	SI Engines: Combustion in SI engine, Flame speed.	[1]	CO2	28/08/19	28/08/19	Deepan
9.	1	Ignition delay, Abnormal combustion and it's control.	[1]	CO2	29/08/19	29/08/19	Deepan
10.	2	Combustion chamber design for SI engines. Carburetion, Mixture requirements.	[1]	CO2	03/09/19 04/09/19	03/09/19 04/09/19	Deepan
11.	1	Carburetors and fuel injection system in SI Engine Ignition system requirements.	[1]	CO2	04/09/19	04/09/19	Deepan
12.	1	Magneto and battery ignition systems.	[1,2]	CO2	05/09/19	05/09/19	Deepan
13.	1	Ignition timing and spark plug. Electronic ignition, Scavenging in 2 Stroke engines.	[1]	CO2	17/09/19	17/09/19	Deepan
14.	1	Supercharging and its effect.	[1]	CO2	18/09/19	18/09/19	Deepan
15.	1	CI Engine: Combustion in CI engines, Ignition delay.	[1]	CO3	19/09/19	19/09/19	Deepan
16.	2	Knock and it's control. Combustion chamber design of CI engines.	[1,2]	CO3	25/09/19 26/09/19	25/09/19 26/09/19	Deepan

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17.	1	Fuel injection in CI engines, Requirements.	[1]	CO3	01/10/19	01/10/19	Defpa
18.	2	Types of injection systems. Fuel pumps.	[1]	CO3	03/10/19 09/10/19	03/10/19 09/10/19	Defpa
19.	2	Fuel injectors, Injection timings, *Exhaust emissions from SI engine.	[1,2]	CO3	10/10/19 15/10/19	10/10/19 15/10/19	Defpa
20.	1	CI engine and it's control.	[1]	CO3	16/10/19	16/10/19	Defpa
21.	2	Radiators and cooling fans, Engine friction, Lubrication principle.	[1,3]	CO4	17/10/19 05/11/19	17/10/19 05/11/19	Defpa
22.	1	Type of lubrication, Lubrication oils, Crankcase ventilation..	[1]	CO4	06/11/19	06/11/19	Defpa
23.	1	Fuels: Fuels for SI and CI engine, Important qualities of SI and CI engine fuels, measurement.	[1]	CO4	07/11/19	07/11/19	Defpa
24.	2	Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels.	[1]	CO4	13/11/19 14/11/19	13/11/19 14/11/19	Defpa
25.	1	LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.	[1]	CO4	19/11/19	19/11/19	Defpa
26.	2	Testing and Performance: Performance parameters. Basic measurements, Blow by Testing of SI and CI engines.	[1]	CO4	21/11/19	21/11/19	Defpa
27.	1	Compressors: Classification, Reciprocating compressors.	[3]	CO5	26/11/19	26/11/19	Defpa
28.	2	Single and Multi stage compressors, Intercooling.	[3]	CO5	26/11/19	26/11/19	Defpa
29.	1	Volumetric efficiency. Rotary compressors, Classification.	[3]	CO5	27/11/19	27/11/19	Defpa
30.	2	Centrifugal compressor, Axial compressors.	[3]	CO5	27/11/19 28/11/19	27/11/19 28/11/19	Defpa
31.	2	*Surging and stalling, Roots blower, Vaned compressor.	[3]	CO5	28/11/19	28/11/19	Defpa
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BOOKS-

1. I.C Engine, by Ganeshan, Tata McGraw Hill Publishers.
2. A Course in Internal Combustion Engines, by V.M Domkundwar, Dhanpat Rai Publications.
3. Thermal Engineering, by Mahesh M Rathore , Tata McGraw Hill Publishers.

* Beyond the Syllabus

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In Pursuit of Excellence	**Tutorial-1**	SESSION-2019-2020
		SEM-

Tutorial 1 [CO - 1]

Sr. No.	No. of Periods	Topics/Sub Topics	Coverage Date			Sign
			Batch A	Batch B	Batch C	
1.	1	Introduction	13/08/19	14/08/19	X	

1. Mention the various assumption made in air standard cycle analysis.
2. Define the term-
   (i) Clearance Volume
   (ii) Swept Volume
   (iii) Compression Ratio
3. Draw the p-V and T-s diagram of Otto Cycle and drive the expression for the efficiency of Otto Cycle .
4. In an engine working on ideal Otto cycle, the temperature at the beginning and end of compression is 45°C and 370°C. Find the compression ratio and air standard efficiency of the engine. Assume γ=1.4
5. Determine the air standard efficiency of an Otto cycle if the pressure at the beginning and at the end of compression are 1 bar and 8 bar respectively.

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In Pursuit of Excellence	**Tutorial-2**	SESSION-2019-2020
		SEM-

Tutorial 2 [CO - 1]

Sr. No.	No. of Periods	Topics/Sub Topics	Coverage Date			Sign
			Batch A	Batch B	Batch C	
1.	1	2-Stroke & 4-Stroke Engine	27/08/19	28/08/19	X	

1. Write down the difference between the followings
   b. Two and Four stroke Engine
   c. SI and CI Engine
   d. IC and EC Engine
   e. Otto cycle and Diesel cycle

2. With the help of neat sketch explain the working of 4- stroke S.I engine. Explain the function of its main component

3. Compare a petrol engine with a diesel engine.

4. Explain the working of 2-stroke S.I engine with a neat sketch

1. **5.** Write down the difference between the followings
   a. Two and Four stroke Engine
   b. SI and CI Engine
   c. IC and EC Engine
   d. Otto cycle and Diesel cycle
   e. VALVE TIMING DIAGRAM of high and low speed Engines

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In Pursuit of Excellence	**Tutorial-3**	SESSION-2019-2020
		SEM-

Tutorial 3 [CO - 2]

Sr. No.	No. of Periods	Topics/Sub Topics	Coverage Date			Sign
			Batch A	Batch B	Batch C	
1.	1	Spark Ignition Engine	03/09/19	04/9/19	x	Deepak

1. Define Carburetion.
2. Explain Rich, Lean and Stoichiometric mixture.
3. Explain why simple carburettor cannot meet the various engine requirements.
4. Write short notes on followings
    a. Compensating devices of carburettor.
    b. MPFI system
    c. Theory of carburetion
    d. Mixture requirement of carburettor
5. Define combustion, flame, flame front and auto ignition.
6. Give a brief account chain theory of combustion.
7. Explain main stages of combustion in S.I engines.
8. Explain the combustion in SI engine with the help of P-θ diagram.

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In Pursuit of Excellence	**Tutorial-4**	SESSION-2019-2020 SEM-

Tutorial 4 [CO - 2]

Sr. No.	No. of Periods	Topics/Sub Topics	Coverage Date			Sign
			Batch A	Batch B	Batch C	
1.	1	Combustion in Spark Ignition Engine	17/09/19	18/09/19	X	

1. Define combustion, flame, flame front and auto ignition.
2. Give a brief account chain theory of combustion.
3. Explain main stages of combustion in S.I engines.
4. Explain the combustion in SI engine with the help of P-θ diagram.
5. What are the reasons of abnormal combustion? How it can be controlled? (Give reasons for your answer)

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In Pursuit of Excellence	Tutorial-5	SESSION-2019-2020
		SEM-

Tutorial 5 [CO - 3]

Sr. No.	No. of Periods	Topics/Sub Topics	Coverage Date			Sign
			Batch A	Batch B	Batch C	
1.	1	Compression Ignition Engine	01/10/19	09/10/19	X	

1. Sketch and explain the construction and working of a fuel injector and also name different types of nozzles used in in it?
2. Show different stages of combustion on pressure v/s crank angle diagram. How do the fuel quality injection timing and compression ratio affect the knocking in diesel engine?
3. Give brief classification of diesel injection system with explanation of system.

Give brief c

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In Pursuit of Excellence	Tutorial-6	SESSION-2019-2020
		SEM-

Tutorial 6 [CO - 3]

Sr. No.	No. of Periods	Topics/Sub Topics	Coverage Date			Sign
			Batch A	Batch B	Batch C	
1.	1	Compression Ignition Engine	15/10/19	16/10/19	-	

1. What are the requirement of a CI fuel injection system? Sketch a common rail injection system and explain its working?

2. Describe the two basic method of generating air swirl in CI engine combustion chamber ?

3. What is ignition delay in case of CI engine and explain variables affecting ignition delay such as compression ratio, engine load, ignition advance , engine speed , etc?

4. What are the types of combustion chamber used in CI engine ?

5. Knocking in CI engine occur at start of combustion whereas in SI engine occur at end charge explain and compare knocking in SI and CI engine ?

6. write a brief note on exhaust emission from SI and CI engine and also explain methods such as thermal converters, catalytic converter and crankcase ventilation to control these emission

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In Pursuit of Excellence	**Tutorial-7**	SESSION-2019-2020 SEM- 5th

Tutorial 7 [CO - 4]

Sr. No.	No. of Periods	Topics/Sub Topics	Coverage Date			Sign
			Batch A	Batch B	Batch C	
1.	1	Engine Cooling & Lubrication	05/11/19	05/11/19	X	

1. Discuss the following properties of Lubricating oil
   (a) Viscosity index (b) Flash point (c) Cloud Point (d) Oiliness (e) Detergency

   OR

   Discuss the properties of lubricating oil in brief.
2. Write objective of lubrication. Explain wet and dry lubrication system with neat sketch.
3. Differentiate between dry and wet sump lubrication system, where dry lubrication system is preferred and why?
4. What do you understand by crank case ventilation? Discuss the types of crank case ventilation.
5. Make comparison of water and air cooling system of the engine.

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In Pursuit of Excellence	**Tutorial-8**	SESSION-2019-2020 SEM- 5th

Tutorial 8 [CO - 4]

Sr. No.	No. of Periods	Topics/Sub Topics	Coverage Date			Sign
			Batch A	Batch B	Batch C	
1.	1	Engine Cooling & Lubrication	06/11/19	06/11/19	X	

1. Discuss the merit and demerit of water and air cooling system.
2. Explain different types of cooling system.
3. Why engine cooling is necessary, Discuss?
4. Describe the types of radiator with neat sketch. Also, explain the importance of fan in radiator.
5. Write short notes on
    a. Cooling fins
    b. Buffles

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In Pursuit of Excellence	**Tutorial-9**	SESSION-2019-2020 SEM-

Tutorial 9 [CO - 5]

Sr. No.	No. of Periods	Topics/Sub Topics	Coverage Date			Sign
			Batch A	Batch B	Batch C	
1.	1	Compressors	13/11/19	13/11/19	Y	

1. What do you understand by surging and stalling in an axial flow compressor?
2. A single acting reciprocating compressor (bore = 14 cm and stroke = 10 cm) having 4% clearance gives the following data obtained from performance test. Suction pressure is 0.1 bar gauge, suction temperature 20 C, atmospheric pressure 1 bar, discharge pressure 6 bar absolute, discharge temperature 180 C, speed 1200 rpm, shaft power 6.3 kW and mass of air delivered 1.7 kg/minute. Find volumetric efficiency, isothermal efficiency and mechanical efficiency.
3. Compare centrifugal and axial compressors as to their advantages and restrictions

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In Pursuit of Excellence	Tutorial-10	SESSION-2019-2020 SEM-

Tutorial 0 [CO - 5]

Sr. No.	No. of Periods	Topics/Sub Topics	Coverage Date			Sign
			Batch A	Batch B	Batch C	
1.	1	Compressors	19/11/19	20/11/19	X	

1. Prove that in case of reciprocating compressor the condition for minimum work per kg of air delivered by its two stage with inter cooling is achieved when intermediate pressure is geometric mean of suction pressure and final delivery pressure
2. Describe the conservation and operation of a two stage reciprocating air compressor with intercooling and also show processes on P-V diagram
3. Write short notes on

   (i) Roots blower (ii) Super charging (iii) Surging and choking.

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In Pursuit of Excellence	ASSIGNMENT - 1	SESSION-2019-2020 SEM-5th

Home Assignment

Unit 1[CO- 1]

1. A gas engine working on Otto cycle has a cylinder bore of 220mm and stroke 300mm. The clearance volume is 1600cc. Find the air standard efficiency. Assume c_p=1.004kJ/kgK and c_v=0.718kJ/kgK for air
2. A Diesel Cycle operates at a pressure of 1 bar at the beginning of compression and the volume is compressed to 1/16 of the initial volume. Heat is supplied until the volume is twice of the clearance volume. Calculate the mean effective pressure of the cycle. (Assume γ=1.4)
3. Draw the p-V and T-s diagram of Dual Cycle and drive the expression for the efficiency of Dual Cycle?
4. Obtain an expression for mean effective pressure of an Otto Cycle?
5. What is the basic difference between an Otto cycle and Diesel cycle?
6. A Diesel Cycle operates at a pressure of 1 bar at the beginning of compression and the volume is compressed to 1/16 of the initial volume. Heat is supplied until the volume is twice of the clearance volume. Calculate the mean effective pressure of the cycle. (Assume γ=1.4)

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In Pursuit of Excellence	**ASSIGNMENT - 2**	SESSION-2019-2020
		SEM-5th

Home Assignment

Unit 1[CO- 1]

1. Explain the working of 2-stroke C.I engine with a neat sketch.
2. What is the function of deflector in 2-Stroke SI engine?
3. How the Engine classified.
4. Explain the working of following
   a. Startified Engine
   b. Two stroke Engine
   c. Four stoke engine
   d. Rotary Engines
5. Draw the VALVE TIMING DIAGRAM of the followings
   a. Four stroke Engine
   b. Two stroke Engine
6. Explain in brief, why actual cycle deviates from theoretical cycle.
7. What are the assumptions of Fuel-air cycles?
8. What factors are considered in fuel-air cycle?
9. Explain the phenomenon of dissociation with the help of graph showing its effects on maximum temperature and pressure.

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In Pursuit of Excellence	ASSIGNMENT - 3	SESSION-2019-2020
		SEM-5th

Home Assignment

Unit 2[CO- 2]

1. Explain the working of simple carburettor with neat sketch. Also, write the advantages and disadvantages of carburettor.
2. Explain briefly the types of carburettor with neat sketch.
3. Sketch the constructional layout of a battery ignition system and explain its working.
4. Compare Battery ignition system with Magneto ignition system.
5. What is the purpose of providing condenser in the ignition system
6. Draw a neat sketch of spark plug and explain its operation.
7. Why electronic ignition system are preferred over conventional ignition system.
8. With neat sketch explain the working of TCI & CDI system.
9. What do you understand by spark advance? Describe any spark advance mechanism used in automobiles.

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In Pursuit of Excellence	**ASSIGNMENT - 4**	SESSION-2019-2020 SEM-5th

Home Assignment

Unit 2[CO- 2]

6. Discuss the factors influencing flame speed.
7. Write short note on
   a. Types of combustion chamber in SI engine. (Draw sketch)
   b. Reaction rate and Propagation rate
8. What design considerations are made for a combustion chamber in SI engine?
9. What is ignition lag in SI engine? Discuss the effect of engine variables on ignition lag.
10. Write short note on ignition advance.
11. Explain the abnormal combustion in SI engine with the help of P-θ diagram.
12. Explain knocking in S.I engine. How do various parameters affect knocking.

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In Pursuit of Excellence	ASSIGNMENT - 5	SESSION-2019-2020
		SEM-5th

Home Assignment

Unit 3[CO- 3]

1. Show the different stages of combustion on pressure v/s crank: angle (p-θ) diagram.
2. How do the fuel quality, injection timing and compression ratio affect the knocking in diesel engine?
3. What are super charging limits for SI and CI engines
4. Describe different phases of CI engine combustion and also abnormal combustion.

5. Describe the two basic methods of generating air swirl in CI engine combustion chambers.
6. Describe the operation of any two types of modern fuel injection systems with sketch. Also explain working of pintle nozzle & pintaux nozzle

7. Sketch some important designs of open combustion chamber for CI engines.
8. How are the injection system classified. Describe them briefly. Why the air injection system is not used nowadays.
9. What is meant by Crankcase ventilation? Explain the details.
10. Explain the types of fuel injection systems in diesel engine.

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In Pursuit of Excellence	**ASSIGNMENT - 6**	SESSION-2019-2020 SEM-5th

Home Assignment

Unit 3[CO- 3]

1. Show the different stages of combustion on pressure v/s crank: angle (p-θ) diagram.
2. How do the fuel quality, injection timing and compression ratio affect the knocking in diesel engine?
3. Explain the working of common rail injection system. A four stroke diesel engine is operating at 2400 rpm. Fuel injection starts at 20° before IDC and ends at 5° after IDC. If the quantity of fuel injected in a cycle is 40 mg, Find the fuel injection rate in kg/sec.
4. Distinguish between the 'Physical ignition delay' and 'Chemical ignition delay'. Discuss the effect of different variables on ignition delay.
5. Sketch and explain the construction and working of a fuel injector' Name different types of nozzles used on it.

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In Pursuit of Excellence	ASSIGNMENT - 7	SESSION-2019-2020
		SEM-5th

Home Assignment

Unit 4[CO- 4]

1. Discuss, how catalytic convertor reduces the pollutants from the engine and why unleaded petrol is required in case of catalytic convertor fitted vehicle.
2. What is the effect of supercharging on power output and fuel consumption? Why supercharging is not preferred in SI engine?
3. State the functions of lubricants in IC engine. Name the different type of lubrication systems used in engines.
4. Explain the working of thermo-syphon cooling system with neat sketch.
5. With the help of a neat sketch explain the working of a radiator.
6. What is the importance of viscosity for lubricating oils ? What are different ways to express it ?

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Invigilators: 1) Name

2) Name

In Pursuit of Excellence	ASSIGNMENT - 9	SESSION-2019-2020
		SEM-5th

Home Assignment

Unit 5[CO- 5]

1. What do you understand by surging and stalling in an axial flow compressor?
2. A single acting reciprocating compressor (bore = 14 cm and stroke = 10 cm) having 4% clearance gives the following data obtained from performance test. Suction pressure is 0.1 bar gauge, suction temperature 20 C, atmospheric pressure 1 bar, discharge pressure 6 bar absolute, discharge temperature 180 C, speed 1200 rpm, shaft power 6.3 kW and mass of air delivered 1.7 kg/minute. Find volumetric efficiency, isothermal efficiency and mechanical efficiency.
3. Compare centrifugal and axial compressors as to their advantages and restrictions
4. Prove that in case of reciprocating compressor the condition for minimum work per kg of air delivered by its two stage with inter cooling is achieved when intermediate pressure is geometric mean of suction pressure and final delivery pressure
5. Describe the conservation and operation of a two stage reciprocating air compressor with intercooling and also show processes on P-V diagram
6. Write short notes on

   (i) Roots blower (ii) Super charging (iii) Surging and choking.

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In Pursuit of Excellence	List of Students	SESSION-2019-2020 SEM- 5th

S.No.	Roll No.	Name of Students
1.	1708240003	ABHINAV GUPTA
2.	1708240005	ABHISHEK CHANDRA
3.	1708240006	ADITYA SHARMA
4.	1708240008	AKSHAT DABAS
5.	1708240011	AMBESH KUMAR PAL
6.	1708240012	ANAS BEIG
7.	1708240013	ANKIT KUMAR GANGWAR
8.	1708240014	ANUJ
9.	1708240015	ANURAG JOSHI
10.	1708240018	ASHEESH KUMAR
11.	1708240019	ASHUTOSH BHARDWAJ
12.	1708240021	AYUSH KUMAR S/O Sri Dinesh Kumar
13.	1708240026	LALIT KUMAR
14.	1708240028	MANJEET SINGH
15.	1708240035	MOHD. SAMAD KHAN
16.	1708240039	PRASHANT CHAUDHARY
17.	1708240040	PRATEEK KUMAR
18.	1708240041	RAJVEER SAINI
19.	1708240043	RISHABH GOEL
20.	1708240048	SARTHAK DIXIT
21.	1708240049	SHASHI PRAKASH
22.	1708240053	SIRAJ AHMAD
23.	1708240056	SUMIT MASSEY
24.	1708240057	SUNEEL KUMAR
25.	1608240067	RAJNISH CHAUHAN
26.	1608240066	RAJAT SAINI

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In Pursuit of Excellence	**Record of Monthly Attendance**	SESSION-2019-2020 SEM-5th

AUGEST

S.No.	Roll No.	Name of Students	A	H	
1.	1708240003	ABHINAV GUPTA	12	12	56
2.	1708240005	ABHISHEK CHANDRA	11	12	55
3.	1708240006	ADITYA SHARMA	7	12	26
4.	1708240008	AKSHAT DABAS	10	12	56
5.	1708240011	AMBESH KUMAR PAL	8	12	49
6.	1708240012	ANAS BEIG	3	12	13
7.	1708240013	ANKIT KUMAR GANGWAR	11	12	41
8.	1708240014	ANUJ	8	12	60
9.	1708240015	ANURAG JOSHI	11	12	35
10.	1708240018	ASHEESH KUMAR	6	12	13
11.	1708240019	ASHUTOSH BHARDWAJ	5	12	23
12.	1708240021	AYUSH KUMAR S/O Sri Dinesh Kumar	5	12	42
13.	1708240026	LALIT KUMAR	9	12	42
14.	1708240028	MANJEET SINGH	11	12	38
15.	1708240035	MOHD. SAMAD KHAN	6	12	32
16.	1708240039	PRASHANT CHAUDHARY	12	12	49
17.	1708240040	PRATEEK KUMAR	9	12	42
18.	1708240041	RAJVEER SAINI	7	12	45
19.	1708240043	RISHABH GOEL	12	12	47
20.	1708240048	SARTHAK DIXIT	10	12	23
21.	1708240049	SHASHI PRAKASH	5	12	42
22.	1708240053	SIRAJ AHMAD	6	12	35
23.	1708240056	SUMIT MASSEY	00	12	
24.	1708240057	SUNEEL KUMAR	8	12	28
25.	1608240067	RAJNISH CHAUHAN	2	12	
26.	1608240066	RAJAT SAINI	3	12	

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In Pursuit of Excellence	**Record of Monthly Attendance**	SESSION-2019-2020 SEM-5th

SEPTEMBER

S.No.	Roll No.	Name of Students	A	H
1.	1708240003	ABHINAV GUPTA	8	10
2.	1708240005	ABHISHEK CHANDRA	9	10
3.	1708240006	ADITYA SHARMA	8	10
4.	1708240008	AKSHAT DABAS	9	10
5.	1708240011	AMBESH KUMAR PAL	8	10
6.	1708240012	ANAS BEIG	5	10
7.	1708240013	ANKIT KUMAR GANGWAR	8	10
8.	1708240014	ANUJ	5	10
9.	1708240015	ANURAG JOSHI	8	10
10.	1708240018	ASHEESH KUMAR	5	10
11.	1708240019	ASHUTOSH BHARDWAJ	7	10
12.	1708240021	AYUSH KUMAR S/O Sri Dinesh Kumar	7	10
13.	1708240026	LALIT KUMAR	7	10
14.	1708240028	MANJEET SINGH	6	10
15.	1708240035	MOHD. SAMAD KHAN	6	10
16.	1708240039	PRASHANT CHAUDHARY	8	10
17.	1708240040	PRATEEK KUMAR	7	10
18.	1708240041	RAJVEER SAINI	6	10
19.	1708240043	RISHABH GOEL	9	10
20.	1708240048	SARTHAK DIXIT	5	10
21.	1708240049	SHASHI PRAKASH	6	10
22.	1708240053	SIRAJ AHMAD	5	10
23.	1708240056	SUMIT MASSEY	00	10
24.	1708240057	SUNEEL KUMAR	7	10
25.	1608240067	RAJNISH CHAUHAN	4	10
26.	1608240066	RAJAT SAINI	8	10

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MORADABAD INSTITUTE OF TECHNOLOGY

SET-I

Department Of Mechanical Engineering

Class Test- 1st (Sem-5th)

Session-2019-20

Subject: IC Engine & Compressor
Subject Code: RME-051

M.M:20
Duration: 1 hr.

This paper contains three sections. Section (A), (B) & (C).

All sections are compulsory.

SECTION (A)

Attempt all questions. Each question carries 2 marks.

1. How is Fuel-Air Cycle different from Actual Cycle? [CO-1]
2. Draw P-V & T-s Diagram for Otto, Diesel and Dual Cycle. [CO-1]
3. Draw the actual valve timing diagram for a 4-Stroke and 2-Stroke S.I Engine. [CO-1]
4. What are the assumptions and factors considered in fuel-air cycles? [CO-1]

SECTION (B)

Attempt any two questions. Each question carries 3.5 marks.

1. What is the basic difference between Otto cycle & Diesel cycle? Deduce the expression of work done and thermal efficiency for Otto cycle. [CO-1]
2. In an Ideal Diesel cycle, the pressure and temperature are 1 bar and 27°C respectively. The maximum pressure in the cycle is 47 bar and heat supply during the cycle is 545kJ/kg. Determine

   (i) Compression ratio
   (ii) Temperature at the end of compression.
   (iii) The air-standard efficiency.
   Assume: γ=1.4, Cv=0.718kJ/kgK, Cp=1.005kJ/kgK [CO-1]
3. Draw a labelled diagram of two stroke C.I engine and explain its working. [CO-1]

SECTION (C)

Attempt any one questions. Each question carries 5 marks.

1. Compare Otto and diesel Cycle for-

   (i) Same Maximum pressure and heat input
   (ii) Same Compression ratio and heat rejection. [CO-1]
2. An one-liter cubic capacity, 4-stroke, four cylinder S.I engine has a brake thermal efficiency of 30% and indicated power is 40 kW at full load. At half load, it has a mechanical efficiency of 655. Assume constant mechanical losses, calculate (i) brake power (ii) frictional power (iii) mechanical efficiency at full load (iv) Indicated thermal efficiency. If the volume decreases by 1/8 during the compression stroke, calculate the clearance volume. [CO-1]

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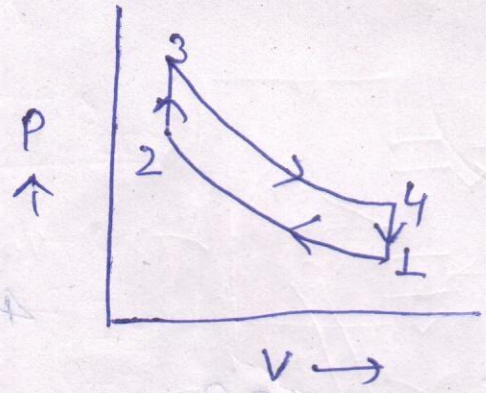
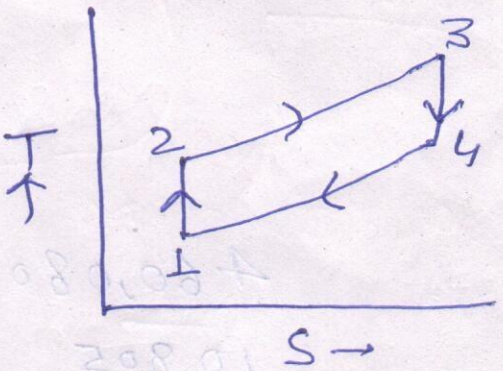
Solution CT- I st
2019-2020
5th sem (Section-A)

1. Fuel-air-cycle → The cycle in which the working fluid is a combination of fuel and air.

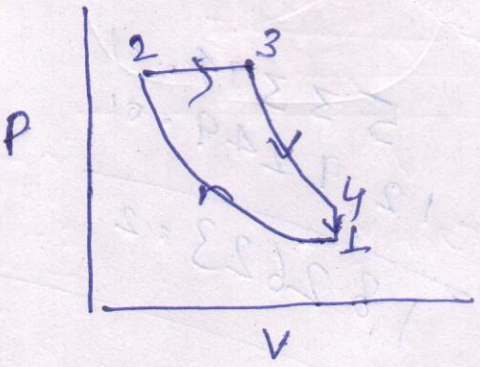
Air standard cycle → The cycle in which the working fluid is pure air.

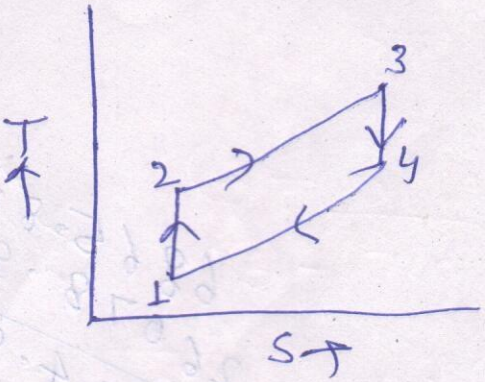
2. Otto Cycle-



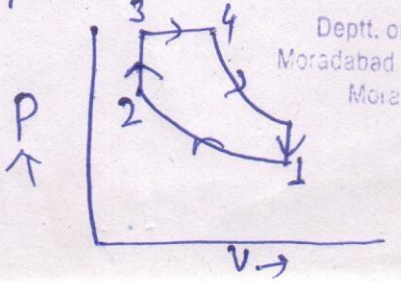


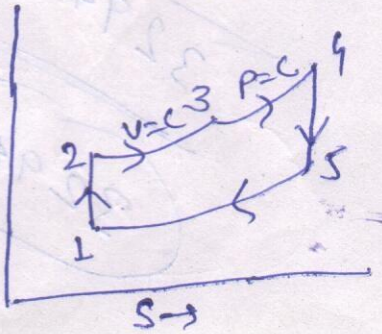
Diesel cycle →





Dual cycle →





(3) Actual valve timing diagram-

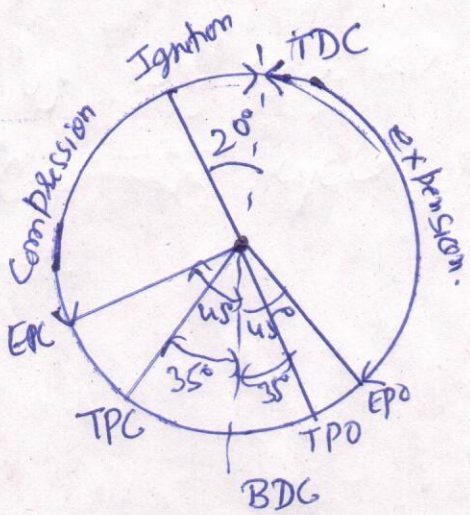
For Two stroke engine-

EPO → Exhaust Port opens 45° befor BDC.

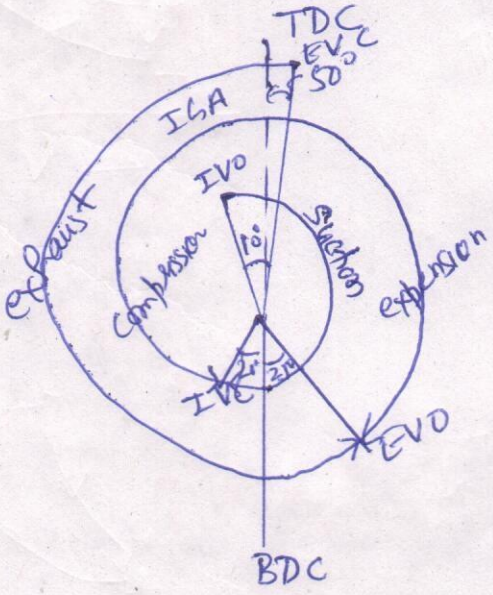
TPO → Transfer port opens 35° before BDC

TPC → Transfer Port closes 35° before BDC

EPC → Exhaust port closes 45° after BDC



For 4-Stroke S.I Engine-



IVO - Inlet valve open
IVC → Inlet valve closed
EVO → Exhaust valve open
EVC → Exhaust valve closed.
IGA → Ignition Advance

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Ans 4. Assumption of fuel air cycle:

(i) Subsequent to combustion process, the mixture is in chemical equilibrium.

(ii) The intake and exhaust process are both at atmospheric pressure

(iii) Compression and expension processes are adiabatic without friction.

(iv) The changes in kinetic energy are negligible.

(v) In case of otto cycle, the mixture of fuel and air is homogeneous and it burns instantaneously at constant volume

Section - B

Otto cycle	Diesel cycle
(i) Heat addition take place at constant volume.	(i) Head addition take place at constant pressure
(ii) Spark plug is used for ignite the air-fuel mixture.	(ii) Fuel Injector is used for ignition.
(iii) Petrol used as a fuel	(iii) Diesel is used as a fuel.

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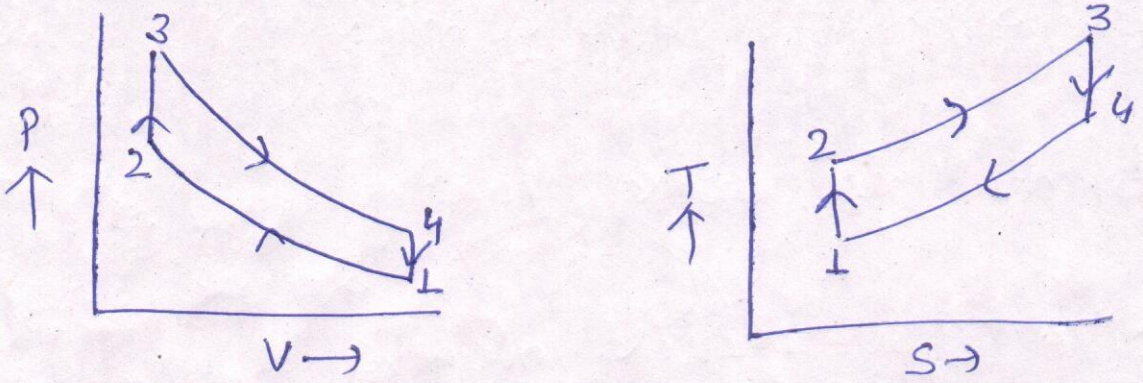
Otto cycle →



Process 1 → 2 (Isentropic compression)

Process 2 → 3 (Heat addition at constant volume) -

$$Q_{in} = mC_v\Delta T \Rightarrow Q_{in} = mC_v(T_3 - T_2) \quad \text{---(1)}$$

Process 3 → 4 (Isentropic expension) -

Process 4 → 1 (Heat rejection at constant volume) -

$$Q_{out} = mC_v\Delta T \Rightarrow Q_{out} = mC_v(T_4 - T_1) \quad \text{---(2)}$$

$$\eta = \frac{W_{net}}{Q_{in}}$$

$$= \frac{Q_{in} - Q_{out}}{Q_{in}}$$

$$\eta = 1 - \frac{Q_{out}}{Q_{in}}$$

$$= 1 - \frac{mC_v(T_4 - T_1)}{mC_v(T_3 - T_2)}$$

$$\eta = 1 - \frac{(T_4 - T_1)}{(T_3 - T_2)} \quad \text{---(3)}$$

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Process 1→2 (Isentropic compression)

$$T_1 V_1^{\gamma} = T_2 V_2^{\gamma-1} \Rightarrow \left(\frac{V_1}{V_2}\right)^{\gamma-1} = \frac{T_2}{T_1}$$

$$(r)^{\gamma-1} = \frac{T_2}{T_1} \Rightarrow T_1 = \frac{T_2}{(r)^{\gamma-1}} \quad \text{—(4)}$$

Process (3-4) Isentropic expansion-

$$T_3 V_3^{\gamma-1} = T_4 V_4^{\gamma-1}$$

$$\left(\frac{V_4}{V_3}\right)^{\gamma-1} = \frac{T_3}{T_4} \Rightarrow (r)^{\gamma-1} = \left(\frac{T_3}{T_4}\right)$$

$$T_4 = \frac{T_3}{(r)^{\gamma-1}} \quad \text{—(5)}$$

From eq (3)

$$\eta = 1 - \frac{\left[\frac{T_3}{(r)^{\gamma-1}} - \frac{T_2}{(r)^{\gamma-1}}\right]}{(T_3 - T_2)}$$

$$\boxed{\eta = 1 - \frac{1}{(r)^{\gamma-1}}} \quad \text{(Proved)}$$

Net workoutput $= \left(\frac{P_3V_3 - P_4V_4}{\gamma-1}\right) - \left(\frac{P_2V_2 - P_1V_1}{\gamma-1}\right)$

mean effective pressure $= \frac{\text{Net work done}}{\text{Swept Volume}}$

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Q2

Given.

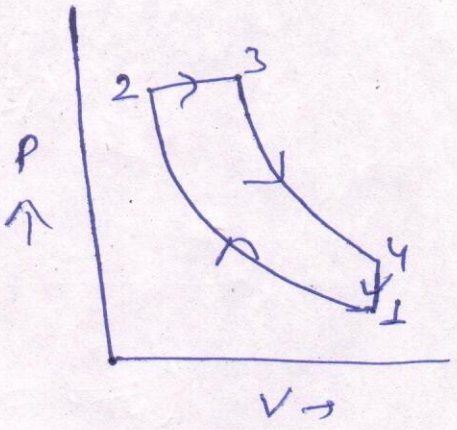
$P_1 = 1$ bar

$T_1 = 27 + 273$

$= 300$ K

$P_2 = P_3 = 47$ bar

$Q_{in} = 545$ kJ/kg



(i) Compression Ratio –

$$P_1 V_1^{\gamma} = P_2 V_2^{\gamma}$$

$$\frac{V_1}{V_2} = \left(\frac{P_2}{P_1}\right)^{1/\gamma} \Rightarrow r = (47)^{1/1.4}$$

$$\boxed{r = 15.38}$$

(ii) Temp at the end of compression –

$$T_1 V_1^{\gamma-1} = T_2 V_2^{\gamma-1}$$

$$\left(\frac{V_1}{V_2}\right)^{\gamma-1} = \frac{T_2}{T_1} \Rightarrow T_2 = T_1 (r)^{\gamma-1}$$

$$T_2 = 300 (15.38)^{0.4}$$

$$\boxed{T_2 = 885.15}$$

(iii) Air standard efficiency –

$$\eta = 1 - \frac{(\beta^{\gamma} - 1)}{\gamma (r)^{\gamma-1} (\beta - 1)}$$

$$\boxed{\eta = 64.6\ \%}$$

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MORADABAD INSTITUTE OF TECHNOLOGY

SET-I

Department Of Mechanical Engineering
SESSIONAL Test- 2nd

Course: B.Tech
Session-2019-20
Subject: IC Engine & Compressor
Max.Marks:20

Semester-5th
Section-E
Subject Code: RME-051
Time: 1 hr. 15 min

Q.No.	1	2	3	4	5	6
CO	2	1	2	5	2	5

This paper contains three sections. Section (A), (B) & (C).

All sections are compulsory.

SECTION (A)

Attempt all questions. Each question carries 2 marks.

1. What are the differences between L-MPFI & D-MPFI.
2. How the thermal efficiency vary with air-fuel ratio for air standard, fuel-air and actual cycle.

SECTION (B)

Attempt all questions. Each question carries 3 marks.

3. With neat sketch explain the working principle of Magneto ignition system.

   OR

   Discuss the objective of supercharging of engine. With neat sketch explain the working of Root Blower.

4. A single-stage reciprocating air compressor takes air in 1.4 kg of air per minute at 1 bar and 17°C and delivers it at 6 bar. Assuming compression process follows the law $pV^{1.35}$=Constant. Calculate indicated power input to compressor.

$\dot{m}_a = 1.4$ kg/min
$P_1 = 1$ bar, $T_1 = 290$K, $P_2 = 6$ bar
$n = 1.35$
$R = 0.287$ kJ/kg K
$T_2 = T_1 \left(\frac{P_2}{P_1}\right)^{\frac{n-1}{n}} = 461.46$K
$W_{in} = \frac{n}{n-1} \dot{m}_a R (T_2 - T_1) = 265.72$ kJ/min
$IP = \frac{W_{in}}{60} = \frac{265.72 \text{ kJ/min}}{60 \text{ s/m}} = 4.43$ kW

SECTION (C)

Attempt all questions. Each question carries 5 marks.

5. With the help of neat sketch explain the working principle of simple carburetor.

   OR

   Explain normal and abnormal combustion in SI engine. Also Factors affecting knocking in SI Engine.

6. Prove that for multistage compression the pressure ratio is given by the expression-

   $\sqrt[x]{\text{(Pressure ratio through the compressor)}}$ where x=No. of Stages

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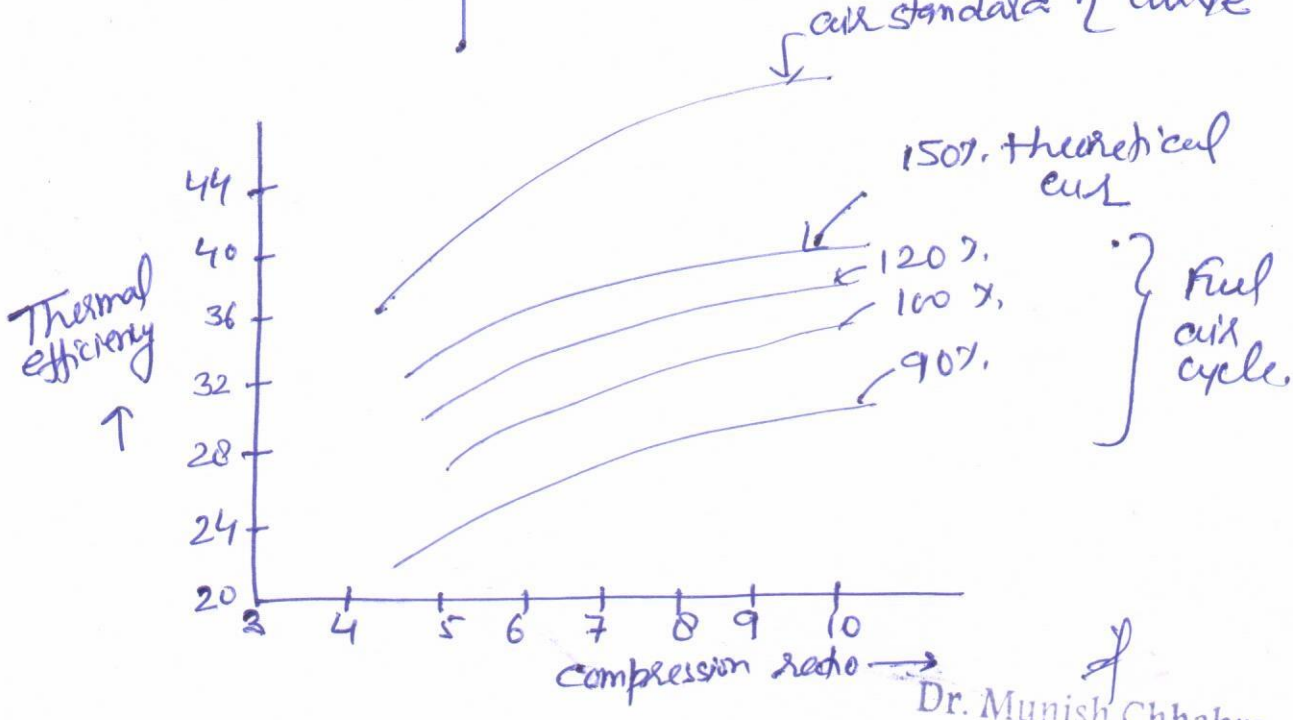
22/10/19

Solution CT-2nd
Session-2019-20
5th sem
section A

1. Difference between L-MPFI & D-MPFI

D-MPFI	L-MPFI
→ This System is the manifold fuel Injection System	→ This System is a port fuel-injection system.
→ In this System, the Vaccum in the intake manifold is first sensed.	→ In this System the amount of air is first sensed.

2-



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2. given-

$m_a = 1.4 \text{ kg/min}$

$P_1 = 1 \text{ bar}$

$T_1 = 17^\circ C + 273$

$T_1 = 290 K$

$P_2 = 6 \text{ bar}$

$n = 1.35$

$R = 0.287 \text{ kJ/kg K}$

For Polytropic compression-

$$T_2 = T_1 \left(\frac{P_2}{P_1}\right)^{\frac{n-1}{n}}$$

$$= 290 \left(\frac{6}{1}\right)^{\frac{1.35-1}{1.35}}$$

$$\boxed{T_2 = 461.46 K}$$

$$W_{in} = \frac{n}{n-1} m_a R (T_2 - T_1)$$

$$= \frac{1.35}{1.35-1} 1.4 \times 0.287 (461.46 - 290)$$

$$\boxed{W_{in} = 265.72 \text{ kJ/min}}$$

Power Input

$$I.P = \frac{W_{in}}{60} = \frac{265.72 \text{ kJ/min}}{60 \text{ sec}}$$

$$\boxed{IP = 4.43 \text{ KW}}$$

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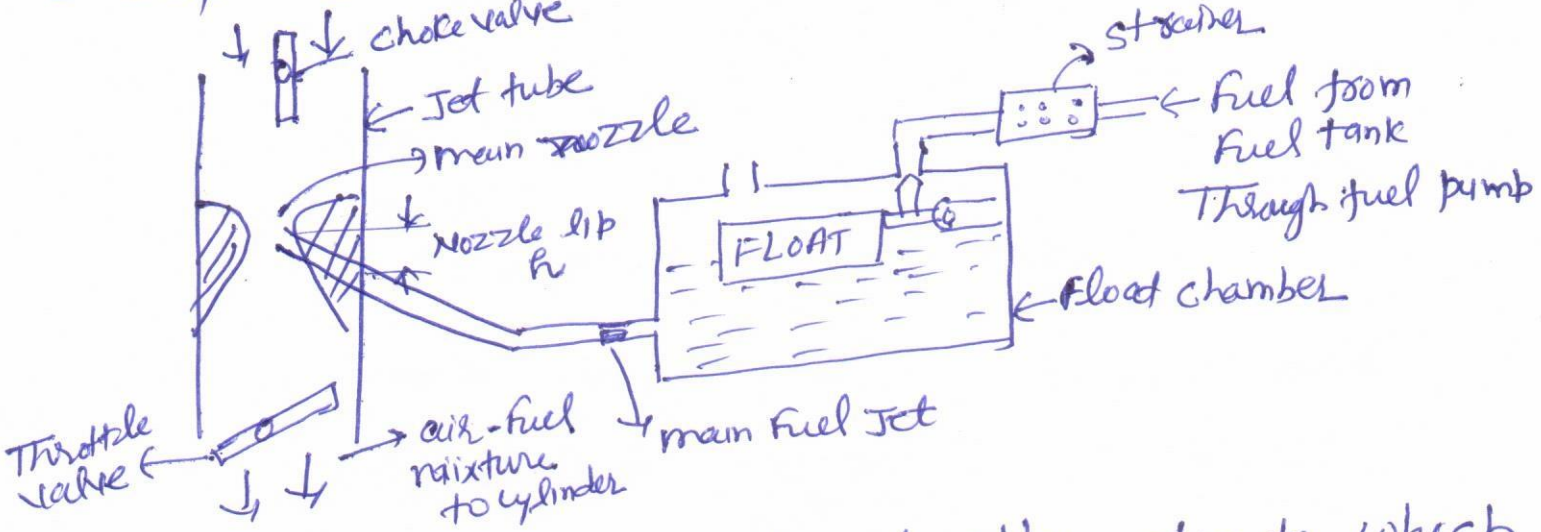
Section-C

5. Simple Carburetor →



→ Float chamber is open to atmosphere due to which the pressure in float chamber is atmospheric.

→ Fuel is supplied to the float chamber through strainer from fuel tank with the help of fuel pump.

→ The Jet tube consists of main nozzle to which fuel is supplied from the float chamber through a main fuel Jet.

→ The suction of the engine draws air through the choke tube and passes through the venturi. Since the area of cross-section at the throat of venturi reduces, the pressure at the main nozzle reduces and the velocity of air increases.

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⑤ Multi stage Compression →

The total power input to a two-stage reciprocating air compressor with complete intercooling is given by-

$$IP = \frac{n}{n-1} m_a R T_1 \left[\left(\frac{P_2}{P_1}\right)^{\frac{n-1}{n}} + \left(\frac{P_3}{P_2}\right)^{\frac{n-1}{n}} - 2 \right]$$

If P_1, T_1 and P_3 are fixed then the optimum value of intermediate pressure P_2 for minimum work input can be obtained by applying condition of minimum

That is $\frac{d(IP)}{dP_2} = 0$

$$\frac{n}{n-1} m_a R T_1 \frac{d}{dP_2} \left[\left(\frac{P_2}{P_1}\right)^{\frac{n-1}{n}} + \left(\frac{P_3}{P_2}\right)^{\frac{n-1}{n}} - 2 \right] = 0$$

$$\Rightarrow \left(\frac{1}{P_1}\right)^{\frac{n-1}{n}} \frac{d}{dP_2} (P_2)^{\frac{n-1}{n}} + (P_3)^{\frac{n-1}{n}} \cdot \frac{d}{dP_2} (P_2)^{\frac{1-n}{n}} = 0$$

$$\Rightarrow \left(\frac{1}{P_1}\right)^{\frac{n-1}{n}} \left(\frac{n-1}{n}\right) (P_2)^{\frac{n-1}{n}-1} + (P_3)^{\frac{n-1}{n}} \left(\frac{1-n}{n}\right) (P_2)^{\frac{1-n}{n}-1} = 0$$

$$\Rightarrow \left(\frac{1}{P_1}\right)^{\frac{n-1}{n}} (P_2)^{-1/n} - (P_3)^{\frac{n-1}{n}} (P_2)^{\frac{1-2n}{n}} = 0$$

$$\Rightarrow (P_1)^{\frac{1-n}{n}} (P_2)^{-1/n} = (P_3)^{\frac{n-1}{n}} (P_2)^{\frac{1-2n}{n}}$$

$$\Rightarrow (P_2)^{-\frac{1}{n}+\frac{2n-1}{n}} = (P_1)^{\frac{n-1}{n}} (P_3)^{\frac{n-1}{n}}$$

$$\Rightarrow (P_2)^{\frac{2(n-1)}{n}} = (P_1 P_2)^{\frac{n-1}{n}}$$

Therefore $P_2^2 = P_1 P_3$ — (1)

$\frac{P_2}{P_1} = \frac{P_3}{P_2}$ — (2)

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Consider multi stage compression with z stages

Then $$\frac{P_2}{P_1} = \frac{P_3}{P_2} = \frac{P_4}{P_3} = \cdots = \frac{P_{(z+1)}}{P_z} = x \text{ (say)}$$

Then $P_2 = xP_1$, $P_3 = xP_2 = x^2P_1$

$P_4 = xP_3 = x^2P_2 = x^3P_1$

and $P_{(z+1)} = xP_z = \cdots = x^zP_1$

or $x^z = \frac{P_{z+1}}{P_1}$

$$x = \sqrt[z]{\frac{P_{(z+1)}}{P_1}}$$

$$\boxed{x = \sqrt[z]{\text{(Pressure ratio through compressor)}}}$$

(Proved)

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MORADABAD INSTITUTE OF TECHNOLOGY SET-II

Department Of Mechanical Engineering

Sessional Test- 3rd

Course: B.Tech
Session-2019-20
Subject: IC Engine & Compressor
Max.Marks:20

Semester-5th
Section-E
Subject Code: RME-051
Time: 1 hr. 15 min

Q.No.	1	2	3	4	5	6
CO	5	3	5	4	3	4

This paper contains three sections. Section (A), (B) & (C).

All sections are compulsory.

SECTION (A)

Attempt all questions. Each question carries 2 marks.

1. Define slip coefficient, work factor and pressure coefficient.

2. Write short note on Diesel Knock and its control.

OR

What is Octane & Cetane Number

SECTION (B)

Attempt all questions. Each question carries 3 marks.

3. What do you mean by surging, stalling, choking with reference to rotary compressor.

OR

With neat sketch explain the working of Axial flow compressor.

4. Discuss the following properties of lubricating oil-
(a) Viscosity index (b) Flash Point (c) Cloud Point

SECTION (C)

Attempt all questions. Each question carries 5 marks.

5. Show the various stages of combustion in CI engine on pressure-crank angle diagram discuss the effect of engine load, speed, injection timing, compression ratio on delay period.

OR

What are types of combustion chamber used in CI engines, explain with neat sketch working of pre combustion chamber and air cell chamber in detail.

6. Describe the types of radiator with neat sketch. Also, explain the importance of fan in radiator.

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Solution - CT-3rd
2019-2020
5th sem Section(A)

1 Slip factor - It is defined as the ratio of whirl velocity to blade tip velocity. It is denoted as ϕ_s. and expressed as-

$$\phi_s = \frac{V_{w2}}{u_2}$$

Work factor → Work factor is defined as ratio of actual work input to Eular work input. It is denoted by ϕ_w and given as-

$$\phi_w = \frac{\text{Actual work input}}{\text{Euler work input}}$$

$$\phi_w = \frac{c_p (T_{02} - T_{01})}{u_2 V_{w2}}$$

Pressure coefficient → Pressure coefficient is defined as the ratio of isentropic work to Euler work. It is designated as-

$$\phi_p = \frac{\text{Isentropic work input}}{\text{Euler work input}}$$

$$\phi_p = \frac{c_p (T_{02s} - T_{01})}{u_2 V_{w2}}$$

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2. Octane Number → Fuels differs widely in their ability to resist the knocking and detonation in S.I engines. It is expressed in terms of octane number. octane number is used for Rating of S.I engine fuels.

Cetane Number → Increased delay period or ignition lag promotes knocking in C.I engines. The property of ignition lag is generally measured by cetane number. The cetane number of a fuel is defined as the percentage by volume of cetane ($C_{16}H_{34}$) in a mixture of cetane and alpha-methyl-naphthalene that produces the same delay period or ignition lag as the fuel being tested under some operating condition on the same engine.

Higher the cetane number of fuel lesser will be the tendency for diesel knock.

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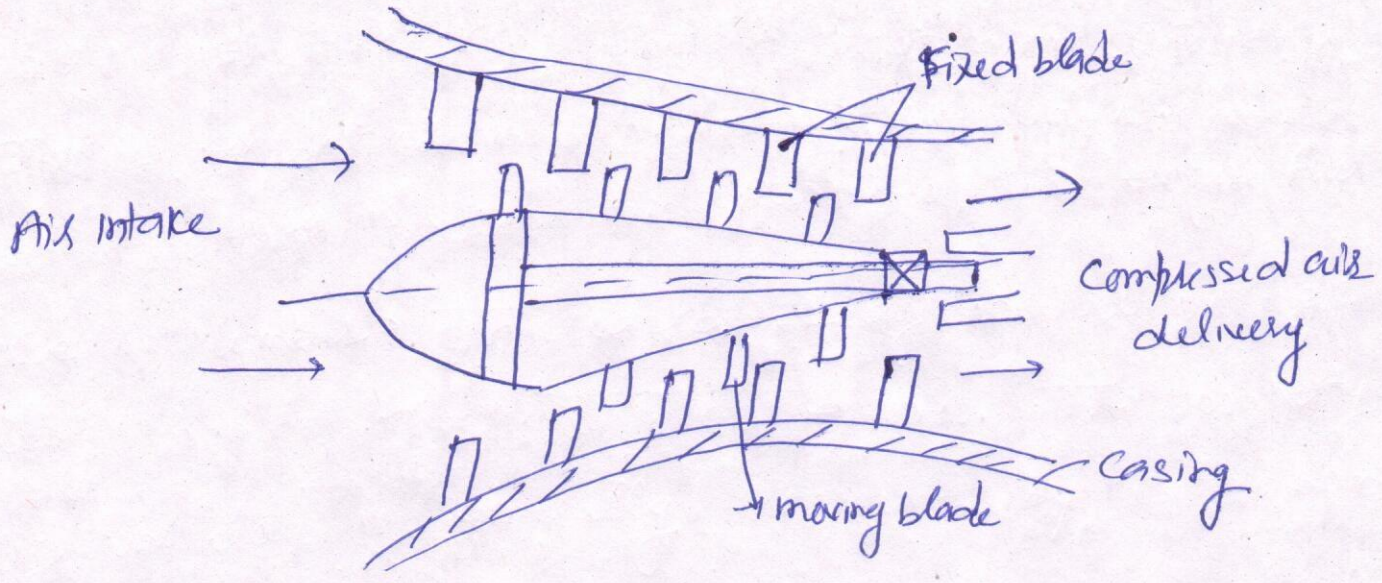
2. Axial Flow Compressor →



In this compressor the air flows parallel to the axis of compressor. Each row of rotor blade is followed by a companion set of ~~stator~~ blades fixed on the casing. A pair of fixed blade and rotor blade is called a stage.

→ The function of the fixed blades is to receive the high velocity gas from the preceeding rotor blades and to direct the flow to the succeeding row of rotor blades. The basic preciple of operation of axial flow compressor is same as that of the centrifugal compressor.

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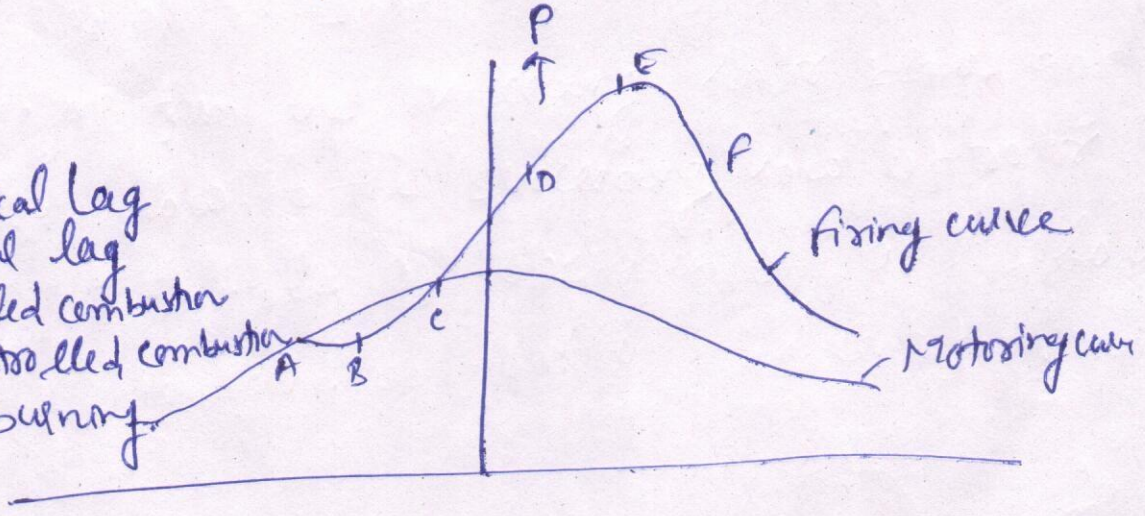
4. (a) Viscosity Index → The variation of velocity of an oil with change in temperature is measured by viscosity index. Higher V.I. of an oil indicates relatively smaller changes in its viscosity with temperature.

(b) Flash Point → The temperature at which the vapour of an oil flash when subjected to a naked flame is known as flash point.

(c) Cloud Point → If an oil is cooled, it will start solidifying at some temperature. The temperature at which the oil starts solidifying is called cloud point.

(5)

Section-C'



A → B physical lag
B - C chemical lag
CD → Controlled combustion
DE → Uncontrolled combustion
EF → After burning

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MORADABAD INSTITUTE OF TECHNOLOGY

SET-II

Department Of Mechanical Engineering

Makeup Class Test (Sem-5th)

Session-2019-20

Subject: IC Engine & Compressor
Subject Code: RME-051

M.M:20
Duration: 1 hr.

This paper contains three sections. Section (A), (B) & (C).

All sections are compulsory.

SECTION (A)

Attempt all questions. Each question carries 2 marks.

1. Draw P-V & T-s Diagram for Otto, Diesel . [CO-1]
2. Draw the actual Theoretical valve timing diagram for a 4-Stroke S.I Engine. [CO-1]

SECTION (B)

Attempt any two questions. Each question carries 3 marks.

1. What is the basic difference between Otto cycle & Diesel cycle? Deduce the expression of thermal efficiency for Otto cycle. [CO-1]
2. Explain the difference between two stroke and four stroke engines. Draw the actual valve timing diagram for a 4 stroke and 2 stroke S.I. Engine. [CO-1]
3. Draw a labelled diagram of 4- stroke S.I engine and explain its working. [CO-1]

SECTION (C)

Attempt all questions. Each question carries 5 marks.

1. Compare Otto and diesel Cycle for-
   (i) Same Maximum pressure and heat input
   (ii) Same Compression ratio and heat rejection. [CO-1]
2. Obtain the expression of air standard efficiency of a diesel cycle. [CO-1]

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Subject Teacher..... Mr. Deepak Singh

MIT Group of Institutions, Moradabad

ATTENDANCE SHEET

Session: 2019-20 **Class Test I / II / III**

Date: 13/09/2019 **Shift: 1ST** **Room No: .....A-315.....**

Year: .....3rd..... **Semester: .....5th.....** **Section/Branch: .....E.....**

Subject Name: IC Engine and Compressors **Subject Code: ...RME-051**

S. No	Roll No.	Name of Student		Branch	Signature
1.	1708240003	ABHINAV GUPTA	15	M.E	Gupta
2.	1708240005	ABHISHEK CHANDRA	6.5	M.E	Abhi
3.	1708240006	ADITYA SHARMA	03.5	M.E	Aditya
4.	1708240008	AKSHAT DABAS	11.5	ME	Akshat
5.	1708240011	AMBESH KUMAR PAL			DEBARRED
6.	1708240012	ANAS BEIG			DEBARRED
7.	1708240013	ANKIT KUMAR GANGWAR	03	ME	Ankit Gangwar
8.	1708240014	ANUJ			DEBARRED
9.	1708240015	ANURAG JOSHI	7.5	ME	Anurag Joshi
10.	1708240018	ASHEESH KUMAR			DEBARRED
11.	1708240019	ASHUTOSH BHARDWAJ			DEBARRED
12.	1708240021	AYUSH KUMAR S/O Sri Dinesh Kumar			DEBARRED
13.					
14.					
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Total No. of Students allotted in Room: 06 **Students Absent:** Nil **Students Present:** 06

Invigilators: 1) Name Prashant Singh **Sign:**

2) Name **Sign:**

Dr. Munish Chhabra
Professor & Head
Deptt. of Mechanical Engg.
Moradabad Institute of Technology
Moradabad - 244001

Subject Teacher: Mr. Deepak (ME)

MIT Group of Institutions, Moradabad

ATTENDANCE SHEET

Session: 2019-20 **Class Test I / II / III**

Date: 13/09/2019 **Shift: 1ST** **Room No: .....A-316.....**

Year: .....3rd..... **Semester: .....6th.....** **Section/Branch: .....E.....**

Subject Name: IC Engine and Compressors **Subject Code: ...RME-051**

S. No	Roll No.	Name of Student		Branch	Signature
1.	1708240026	LALIT KUMAR	4.5	ME	Lalit Kumar
2.	1708240028	MANJEET SINGH			
3.	1708240035	MOHD. SAMAD KHAN			
4.	1708240039	PRASHANT CHAUDHARY	15	ME	Prashant
5.	1708240040	PRATEEK KUMAR	4.5	ME	Prateek
6.	1708240041	RAJVEER SAINI	06	ME	Rajveer Saini
7.	1708240043	RISHABH GOEL	14.5	ME	Rishabh Goel
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Total No. of Students allotted in Room: 05 **Students Absent:** NIL **Students Present:** 05

Designation: Assistant Professor

Department: Mechanical Engineering

Course Details

Name of the Programme: B.Tech. Batch:2017-2021

Branch: Mechanical Engineering Section: 2019-20

Name of Subject: I C Engines & Compressors Subject Code: RME-051

Subject Teacher... Mr. Deepak Singh

MIT Group of Institutions, Moradabad

ATTENDANCE SHEET

Session: 2019-20 | Class Test I / II / III

Date: 13/09/2019 | Shift: 1ST | Room No: .....B-309.

Year: ..... 3rd | Semester: .....5th..... | Section/Branch: ...E.I.M.E...

Subject Name: IC Engine and Compressors | Subject Code: ...RME-051

S. No	Roll No.	Name of Student	Branch	Signature
1.	1708240048	SARTHAK DIXIT	ME	
2.	1708240049	SHASHI PRAKASH		AB
3.	1708240053	SIRAJ AHMAD		AB
4.	1708240056	SUMIT MASSEY		AB
5.	1708240057	SUNEEL KUMAR		AB
6.	1608240067	RAJNISH CHAUHAN		AB
7.	1608240066			AB
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Total No. of Students allotted in Room: 07 Students Absent: 06 (Debarred) Students Present: 01

Invigilators: 1) Name R.K. Gangwar Sign: 13/09/19

2) Name _____ Sign: _____

Dr. Munish Chhabra
Professor & Head
Deptt. of Mechanical Engg.
Moradabad Institute of Technology
Moradabad - 244001

Subject Teacher. Mr. Deepak Singh

MIT Group of Institutions, Moradabad

ATTENDANCE SHEET

Session: 2019-20 **Class Test I / II / III** ✓

Date: 23/10/2019 . **Shift: I** **Room No: .....D-304.....**

Year: .....III..... **Semester: .....5th .....** **Section/Branch: E/ME.....**

Subject Name: IC Engine and Compressors **Subject Code: RME051**

S. No	Roll No.	Name of Student		Branch	Signature
1.	1708240003	ABHINAV GUPTA	13	ME	Gupta
2.	1708240005	ABHISHEK CHANDRA	16	ME	Abhi'
3.	1708240006	ADITYA SHARMA	10	ME	
4.	1708240008	AKSHAT DABAS	14.5	ME	
5.	1708240011	AMBESH KUMAR PAL	6.5	ME	Ambesh
6.	1708240012	ANAS BEIG	ABSENT	ME	
7.	1708240013	ANKIT KUMAR GANGWAR	006	ME	Gangwar
8.	1708240014	ANUJ	13 1/2	ME	Anuj
9.	1708240015	ANURAG JOSHI	12	ME	
10.	1708240018	ASHEESH KUMAR	003	ME	
11.	1708240019	ASHUTOSH BHARDWAJ	6.5	ME	
12.	1708240021	AYUSH KUMAR S/O Sri Dinesh Kumar	ABSENT	ME	
13.	1708240026	LALIT KUMAR	ABSENT	ME	
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Dr. Munish Chhabra
Professor & Head
Deptt. of Mechanical Engg.
Moradabad Institute of Technology
Moradabad - 244001

Total No. of Students allotted in Room: 13 **Students Absent:** 03 **Students Present:** 10

Invigilators: 1) Name Dr. Harendra Kumar **Sign:**

2) Name Rajeev Bhardwaj **Sign:**

Subject Teacher: Mr. Deepak singh.

MIT Group of Institutions, Moradabad

ATTENDANCE SHEET

Session: 2019-20 **Class Test I / II / III** (II)

Date: 23/10/2019 . **Shift: I** **Room No: .....C-306.....**

Year: .....III..... **Semester: .....5th .....** **Section/Branch: E/ME**

Subject Name: IC Engine and Compressors **Subject Code: RME051**

S. No	Roll No.	Name of Student	Branch	Signature
1.	1708240028	MANJEET SINGH	ME	— Debarred —
2.	1708240035	MOHD. SAMAD KHAN 001	ME	Samad
3.	1708240039	PRASHANT CHAUDHARY 10.5	ME	Prashant
4.	1708240040	PRATEEK KUMAR 10.5	ME	Prateek
5.	1708240041	RAJVEER SAINI 6.5	ME	Rajveer Sain
6.	1708240043	RISHABH GOEL 12.5	ME	Rishabh Goel
7.	1708240048	SARTHAK DIXIT	ME	— Debarred —
8.	1708240049	SHASHI PRAKASH	ME	— Debarred —
9.	1708240053	SIRAJ AHMAD	ME	— Debarred —
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Dr. Munish Chhabra
Professor & Head
Deptt. of Mechanical Engg.
Moradabad Institute of Technology
Moradabad - 244001

(4) Debarred

Total No. of Students allotted in Room: 9 **Students Absent:** Nil **Students Present:** (05)

Invigilators: 1) Name Maroof Ali **Sign:**

2) Name Mugdha Mishra **Sign:**

Subject Teacher... Mr. Deepak Kr. ...

MIT Group of Institutions, Moradabad

ATTENDANCE SHEET

Session: 2019-20 **Class Test I / II / III**

Date: 23/10/2019 . **Shift: I** **Room No: .....B-313.....**

Year: .....III..... **Semester: .....5th .....** **Section/Branch: .E/ME.....**

Subject Name: IC Engine and Compressors **Subject Code: RME051**

S. No	Roll No.	Name of Student	Branch	Signature
1.	1708240056	SUMIT MASSEY	ME	←Debarred→
2.	1708240057	SUNEEL KUMAR 6.5	ME	Suneel Kumar
3.	1608240067	RAJNISH CHAUHAN	ME	←Debarred→
4.	1608240066	RAJAT SAINI 02	ME	Rajat Saini
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Dr. Munish Chhabra
Professor & Head
Deptt. of Mechanical Engg.
Moradabad Institute of Technology
Moradabad - 244001

Total No. of Students allotted in Room: 4 **Students Absent:** 2 (Debarred) **Students Present:** 2

Invigilators: 1) Name Narendra Singh Pal **Sign:**

2) Name Kumar Manu **Sign:**

Subject Teacher..Mr. Deepak Singh

MIT Group of Institutions, Moradabad

ATTENDANCE SHEET

Session: 2019-20 **Class Test I / II / III** ✓

Date: 29/11/2019 . **Shift: I** **Room No: .....D-304.....**

Year: .....III..... **Semester: .....5th .....** **Section/Branch: ...E.I.M.E....**

Subject Name: IC Engine and Compressors **Subject Code: RME051**

S. No	Roll No.	Name of Student		Branch	Signature
1.	1708240003	ABHINAV GUPTA	10	ME	Gupta
2.	1708240005	ABHISHEK CHANDRA	18	ME	Abhi
3.	1708240006	ADITYA SHARMA	05	ME	Aditya
4.	1708240008	AKSHAT DABAS	04	ME	Akshat
5.	1708240011	AMBESH KUMAR PAL	07	ME	Ambesh
6.	1708240012	ANAS BEIG		ME	Anas Beig
7.	1708240013	ANKIT KUMAR GANGWAR	08	ME	Ankit gangwar
8.	1708240014	ANUJ		ME	ABSENT
9.	1708240015	ANURAG JOSHI	08	ME	Anurag Joshi
10.	1708240018	ASHEESH KUMAR		ME	D
11.	1708240019	ASHUTOSH BHARDWAJ	03	ME	Ashutosh
12.	1708240021	AYUSH KUMAR S/O Sri Dinesh Kumar		ME	D
13.	1708240026	LALIT KUMAR		ME	D
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Dr. Munish Chhabra
Professor & Head
Deptt. of Mechanical Engg.
Moradabad Institute of Technology
Moradabad-244001

Total No. of Students allotted in Room: 13 **Students Absent:** AB-01, D-04 **Students Present:** 08

Invigilators: 1) Name R. K. Gangwar **Sign:** Rgg

2) Name Ravindra Kumar **Sign:** Ravi

Subject Teacher..... Mr. Deepak .....

MIT Group of Institutions, Moradabad

ATTENDANCE SHEET

Session: 2019-20 **Class Test I / II / III** ✓

Date: 29/11/2019 . **Shift: I** **Room No: .....C-306.....**

Year: .....III..... **Semester: .....5th .....** **Section/Branch: ..E.....**

Subject Name: IC Engine and Compressors **Subject Code: RME051**

S. No	Roll No.	Name of Student	Branch	Signature
1.	1708240028	MANJEET SINGH Debarred	ME	D
2.	1708240035	MOHD. SAMAD KHAN	ME	
3.	1708240039	PRASHANT CHAUDHARY	ME	
4.	1708240040	PRATEEK KUMAR	ME	Absent
5.	1708240041	RAJVEER SAINI	ME	
6.	1708240043	RISHABH GOEL	ME	
7.	1708240048	SARTHAK DIXIT	ME	
8.	1708240049	SHASHI PRAKASH 11	ME	Shashi prakash
9.	1708240053	SIRAJ AHMAD Debarred	ME	D
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Dr. Munish Chhabra
Professor & Head
Deptt. of Mechanical Engg.
Moradabad Institute of Technology
Moradabad - 244001

Total No. of Students allotted in Room: 09 **Students Absent:** ~~08~~ 06 **Students Present:** 01

Invigilators: 1) Name Manas Singhal **Sign:**

2) Name Nikita Agarwal **Sign:** NA

Subject Teacher.....

MIT Group of Institutions, Moradabad

ATTENDANCE SHEET

Session: 2019-20 **Class Test I / II / III** ✓

Date: 29/11/2019 . **Shift: I** **Room No: .....B-313.....**

Year: .....III..... **Semester: .....5th .....** **Section/Branch: ...B./ME....**

Subject Name: IC Engine and Compressors **Subject Code: RME051**

S. No	Roll No.	Name of Student	Branch	Signature
1.	1708240056	SUMIT MASSEY	ME	
2.	1708240057	SUNEEL KUMAR	ME	Absent
3.	1608240067	RAJNISH CHAUHAN	ME	
4.		RAJAT SAINI	ME	
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Dr. Munish Chhabra
Professor & Head
Deptt. of Mechanical Engg.
Moradabad Institute of Technology
Moradabad - 244001

Total No. of Students allotted in Room: 04 **Students Absent:** 04 **Students Present:** Nil

Invigilators: 1) Name Narendra Singh Pal **Sign:** ____

2) Name Mohan Dutt **Sign:** ____

Makeup CT

Subject Teacher .....

MIT Group of Institutions, Moradabad

ATTENDANCE SHEET

Session: 2019-20

Class Test I / II / III

Date: ..... Shift: ..... Room No: .....

Year: 3rd Semester: 5th Section/Branch: E.I.M.E

Subject Name: I.C. Engine & Compressor Subject Code: RME-051

S. No	Roll No.	Name of Student	Branch	Signature
1.	1708240048	Sarthak Dixit	ME	
2.	1708240057	Suneel Kumar	ME	
3.	1708240028	Manjeet Singh	ME	manjeet singh
4.	1608240067	Rajnish Chauhan	ME	Chauhan
5.	1708240019	Ashutosh Bhardwaj	"	
6.	1708240021	Ayush Kumar	"	
7.	1708240018	Ashutosh Kumar	"	
8.	1608240066	Rajat Saini	"	
9.	1708240012	Anas Beig	"	
10.	1708240026	Lalit Kumar	"	
11.	1708240035	Mohd. Samad	"	
12.	1708240053	Suraj Ahmad	ME	Suraj Ahmad
13.	1608240049	Pharsh Pratap	ME	
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Dr. Munish Chhabra
Professor & Head
Deptt. of Mechanical Engg.
Moradabad Institute of Technology
Moradabad - 244001

Total No. of Students allotted in Room: _____ Students Absent: _____ Students Present: _____

Invigilators: 1) Name _____ Sign: _____

2) Name _____ Sign: _____

In Pursuit of Excellence	**List of Students having short attendance**	SESSION-2019-2020 SEM-5th

S No.	Roll No.	Name of Student	RME-051		% Att.
			A	H	
1	1708240012	ANAS BEIG	16	30	53.33
2	1708240014	ANUJ	21	30	70.00
3	1708240018	ASHEESH KUMAR	22	30	73.33
4	1708240019	ASHUTOSH BHARDWAJ	21	30	70.00
5	1708240021	AYUSH KUMAR	21	30	70.00
6	1708240040	PRATEEK KUMAR	20	30	66.67
7	1708240041	RAJVEER SAINI	18	30	60.00
8	1708240048	SARTHAK DIXIT	22	30	73.33
9	1708240049	SHASHI PRAKASH	19	30	63.33
10	1708240053	SIRAJ AHMAD	19	30	63.33
11	1708240057	SUNEEL KUMAR	22	30	73.33
12	1608240067	RAJNISH CHAUHAN	14	30	46.67

Dr. Munish Chhabra
Professor & Head
Deptt. of Mechanical Engg.
Moradabad Institute of Technology
Moradabad - 244001

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Moradabad Institute of Technology

3rd Year 5th Semester

CLASS TEST-1ST Marks

Branch- Mechanical Engineering **Section- E**

Subject: IC Engine and Compressors **Subject Code- RME-051**

S. No.	Roll No.	Name of Students	SECTION-A (8)				SECTION-B (7)			SECTION-C (5)		TOTAL (20)
		QUESTION NO.	1	2	3	4	1	2	3	1	2	
1.	1708240003	ABHINAV GUPTA	2	2	1	1	3.5	3		2.5		15
2.	1708240005	ABHISHEK CHANDRA	00	2	1	00	2	1.5			00	6.5
3.	1708240006	ADITYA SHARMA	00	1.5	1		1	00				3.5
4.	1708240008	AKSHAT DABAS	00	2			3.5	3.5		2.5		11.5
5.	1708240011	AMBESH KUMAR PAL	DEBARRED									
6.	1708240012	ANAS BEIG	DEBARRED									
7.	1708240013	ANKIT KUMAR GANGWAR	00	1	00	1		1	00		00	03
8.	1708240014	ANUJ	DEBARRED									
9.	1708240015	ANURAG JOSHI	1	2	1	1	1	00		1.5		7.5
10.	1708240018	ASHEESH KUMAR	DEBARRED									
11.	1708240019	ASHUTOSH BHARDWAJ	DEBARRED									
12.	1708240021	AYUSH KUMAR S/O Sri Dinesh Kumar	DEBARRED									
13.	1708240026	LALIT KUMAR		2			1	1.5				4.5
14.	1708240028	MANJEET SINGH	DEBARRED									
15.	1708240035	MOHD. SAMAD KHAN	DEBARRED									
16.	1708240039	PRASHANT CHAUDHARY	2	2		2	3.5	3.5			2	15
17.	1708240040	PRATEEK KUMAR	00	2		00	2.5			00		4.5
18.	1708240041	RAJVEER SAINI		2			3		1	00		6
19.	1708240043	RISHABH GOEL	1	2	2	1	2.5	1		5		15.5
20.	1708240048	SARTHAK DIXIT	2	2	1.5	00	1					6.5
21.	1708240049	SHASHI PRAKASH	DEBARRED									
22.	1708240053	SIRAJ AHMAD	DEBARRED									
23.	1708240056	SUMIT MASSEY	DEBARRED									
24.	1708240057	SUNEEL KUMAR	DEBARRED									
25.	1608240067	RAJNISH CHAUHAN	DEBARRED									
26.	1608240066	RAJAT SAINI	DEBARRED									

TOTAL NO. OF COPIES=12

Deepak

Deepak Singh
Assistant Professor
ME Department

Dr. Munish Chhabra
Professor & Head
Deptt. of Mechanical Engg.
Moradabad Institute of Technology

Moradabad Institute of Technology

3rd Year 5th Semester

CLASS TEST-2ND Marks

Branch- Mechanical Engineering **Section E**

Subject: IC Engine and Compressors **Subject Code- RME-051**

S. No.	Roll No.	Name of Students	SECTION-A (4)		SECTION-B (6)		SECTION-C (10)		TOTAL (20)
		QUESTION NO.	1	2	3	4	5	6	
1.	1708240003	ABHINAV GUPTA	1	1	3	2.5	2.5 05	3	~~13~~ 15.5
2.	1708240005	ABHISHEK CHANDRA	1.5	00	2.5	2	5	5	16
3.	1708240006	ADITYA SHARMA	00	NA	1.5	2.5	2	4	10
4.	1708240008	AKSHAT DABAS	1.5	00	2	3	3	5	14.5
5.	1708240011	AMBESH KUMAR PAL	NA	00	1	2.5	2	1	6.5
6.	1708240012	ANAS BEIG	DEBARRED						
7.	1708240013	ANKIT KUMAR GANGWAR	00	00	2	1.5	2.5	00	06
8.	1708240014	ANUJ	00	NA	2.5	2.5	3.5	5	13.5
9.	1708240015	ANURAG JOSHI	1	00	1.5	2	3.5	4	12
10.	1708240018	ASHEESH KUMAR	NA	NA	1.5	00	1.5	NA	03
11.	1708240019	ASHUTOSH BHARDWAJ	NA	NA	2	00	2.5	2	6.5
12.	1708240021	AYUSH KUMAR S/O Sri Dinesh Kumar	ABSENT						
13.	1708240026	LALIT KUMAR	DEBARRED						
14.	1708240028	MANJEET SINGH	DEBARRED						
15.	1708240035	MOHD. SAMAD KHAN	NA	NA	NA	01	00	NA	01
16.	1708240039	PRASHANT CHAUDHARY	1	2	NA	3	4.5	NA	10.5
17.	1708240040	PRATEEK KUMAR	00	NA	3	03	4.5	NA	10.5
18.	1708240041	RAJVEER SAINI	NA	NA	2.5	NA	4	NA	6.5
19.	1708240043	RISHABH GOEL	00	1	2.5	2	4	3	12.5
20.	1708240048	SARTHAK DIXIT	DEBARRED						
21.	1708240049	SHASHI PRAKASH	DEBARRED						
22.	1708240053	SIRAJ AHMAD	DEBARRED						
23.	1708240056	SUMIT MASSEY	DEBARRED						
24.	1708240057	SUNEEL KUMAR	NA	00	NA	2	2	2.5	6.5
25.	1608240067	RAJNISH CHAUHAN	DEBARRED						
26.	1608240066	RAJAT SAINI	NA	NA	1	NA	1	NA	02

TOTAL NO. OF COPIES=17

Deepak Singh
Assistant Professor
ME Department

Dr. Munish Chhabra
Professor & Head
Deptt. of Mechanical Engg.
Moradabad Institute of Technology
Moradabad - 244001

Moradabad Institute of Technology

3rd Year 5th Semester

CLASS TEST-3rd Marks

Branch- Mechanical EngineeringSection E

Subject: IC Engine and Compressors **Subject Code- RME-051**

S. No.	Roll No.	Name of Students	SECTION-A (4)		SECTION-B (6)		SECTION-C (10)		TOTAL (20)
		QUESTION NO.	**1**	**2**	**3**	**4**	**5**	**6**	
1.	1708240003	ABHINAV GUPTA	NA	2	3	3	5	5	18
2.	1708240005	ABHISHEK CHANDRA	1	1	3	3	5	5	18
3.	1708240006	ADITYA SHARMA	NA	1	NA	NA	3	1	05
4.	1708240008	AKSHAT DABAS	NA	NA	3	1	NA	00	04
5.	1708240011	AMBESH KUMAR PAL	NA	2	NA	NA	5	NA	07
6.	1708240012	ANAS BEIG	DEBARRED						
7.	1708240013	ANKIT KUMAR GANGWAR	NA	2	NA	1	4	1	08
8.	1708240014	ANUJ	ABSENT						
9.	1708240015	ANURAG JOSHI	0	2	2	00	4	00	08
10.	1708240018	ASHEESH KUMAR	DEBARRED						
11.	1708240019	ASHUTOSH BHARDWAJ	NA	1	NA	NA	2	NA	03
12.	1708240021	AYUSH KUMAR S/O Sri Dinesh Kumar	DEBARRED						
13.	1708240026	LALIT KUMAR	DEBARRED						
14.	1708240028	MANJEET SINGH	DEBARRED						
15.	1708240035	MOHD. SAMAD KHAN	DEBARRED						
16.	1708240039	PRASHANT CHAUDHARY	ABSENT						
17.	1708240040	PRATEEK KUMAR	ABSENT						
18.	1708240041	RAJVEER SAINI	ABSENT						
19.	1708240043	RISHABH GOEL	ABSENT						
20.	1708240048	SARTHAK DIXIT	DEBARRED						
21.	1708240049	SHASHI PRAKASH			00	2	4	5	11
22.	1708240053	SIRAJ AHMAD	DEBARRED						
23.	1708240056	SUMIT MASSEY	DEBARRED						
24.	1708240057	SUNEEL KUMAR	ABSENT						
25.	1608240067	RAJNISH CHAUHAN	DEBARRED						
26.	1608240066	RAJAT SAINI	DEBARRED						

TOTAL NO. OF COPIES=09

Deepak Singh

Assistant Professor

ME Department

Dr. Munish Chhabra

Professor & Head

Deptt. of Mechanical Engg.

Moradabad Institute of Technology

Moradabad - 244001

Moradabad Institute of Technology

3rd Year 5th Semester

MAKEUP TEST Marks

Branch- Mechanical EngineeringSection E

Subject: IC Engine and Compressors **Subject Code- RME-051**

S. No.	Roll No.	Name of Students	SECTION-A (4)		SECTION-B (6)		SECTION-C (10)		TOTAL (20)
		QUESTION NO.	1	2	3	4	5	6	
1.	1708240003	ABHINAV GUPTA							
2.	1708240005	ABHISHEK CHANDRA							
3.	1708240006	ADITYA SHARMA							
4.	1708240008	AKSHAT DABAS							
5.	1708240011	AMBESH KUMAR PAL							
6.	1708240012	ANAS BEIG	2	2	3	3	4	5	19
7.	1708240013	ANKIT KUMAR GANGWAR							
8.	1708240014	ANUJ							
9.	1708240015	ANURAG JOSHI							
10.	1708240018	ASHEESH KUMAR	2	2	3	3		5	15
11.	1708240019	ASHUTOSH BHARDWAJ	2	2	1.5	1		3.5	10
12.	1708240021	AYUSH KUMAR S/O Sri Dinesh Kumar	2	2	3	3	4	5	19
13.	1708240026	LALIT KUMAR	2	2	2	2	5		15
14.	1708240028	MANJEET SINGH	2	2	3	3	4	5	19
15.	1708240035	MOHD. SAMAD KHAN	2	2	3	3	4	5	19
16.	1708240039	PRASHANT CHAUDHARY							
17.	1708240040	PRATEEK KUMAR							
18.	1708240041	RAJVEER SAINI							
19.	1708240043	RISHABH GOEL							
20.	1708240048	SARTHAK DIXIT	2	2	3	3	1	2	13
21.	1708240049	SHASHI PRAKASH	1	1	3	2.5	1	1.5	10
22.	1708240053	SIRAJ AHMAD	2	2	3	3	4	5	19
23.	1708240056	SUMIT MASSEY							
24.	1708240057	SUNEEL KUMAR	2	2	3		3	1	11
25.	1608240067	RAJNISH CHAUHAN	2	2	3	3	4	5	19
26.	1608240066	RAJAT SAINI	2	2	3	3	1	5	16

TOTAL NO. OF COPIES=13

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In Pursuit of Excellence	**List of Weak Students** (Action taken for Improvement)	SESSION-2019-2020
		SEM-5th

S No.	Roll No.	Name of Student	CT-1	CT-2	CT-3
1.	1708240012	ANAS BEIG	D	D	D
2.	1608240066	RAJAT SAINI	D	02	D
3.	1708240053	SIRAJ AHMAD	D	D	D
4.	1608240067	RAJNISH CHAUHAN	D	D	D

Action Plan for Slow Learner

(1) A question bank based on the previous years' question papers, is provided to the students for better preparation.

(2) Regular monitoring of their progress is done by observing their performance in lectures, tutorials and labs.

(3) Separate special classes for weak students are arranged. It helps in clarifying the doubts and re-explaining of difficult topics to such students.

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In Pursuit of Excellence	**List of Bright Students** (Action taken for enhancing performance)	SESSION-2019-2020
		SEM-5th

S. No.	Roll No.	Name of Students	CT-1	CT-2	CT-3
1.	1708240003	ABHINAV GUPTA	15	15.5	18
2.	1708240005	ABHISHEK CHANDRA	6.5	16	18
3.	1708240039	PRASHANT CHAUDHARY	15	10.5	A
4.	1708240043	RISHABH GOEL	15.5	12.5	A

Action Plan for Fast Learner

(1) Students are encouraged to enhance their skills by joining NPTEL/MOOC or any other special training course based on their area of interest.
(2) Questions of competitive exam level regularly taught to students.
(3) Strong monitoring of self learning activities of students.
   (a) Students are encouraged to read different books and present various topics as seminar in order to enhance the presentation and communication skills.
   (b) Students are encouraged to prepare their own notes of each topics.

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MORADABAD INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
Session-2019-2020
Question Bank For Weak Students

Course : B.Tech **Semester : 5th**

Subject : - IC Engine & Compressors **Subject Code:RME-051**

UNIT-1

1. Define Engine.
2. What is meant by valve timing diagram?
3. Obtain the expression of air standard efficiency of a diesel cycle.
4. Describe classification of I.C. engines.
5. Explain the difference between two stroke and four stroke engines. Draw the actual valve timing diagram for a 4 stroke and 2 stroke S.I. Engine.
6. Discuss the use of LPG as SI engine Fuel.
7. Write the various fuels used in IC engines.
8. What is Octane & Cetane Number.
9. Write down the formula of efficiency of Otto & Diesel Cycle.
10. Define Compression Ratio.
11. Compare SI & CI engine with respect to Compression ratio & Ignition.
12. Why Rich mixture is required for maximum power.
13. Explain the Significance of fuel air cycle.

UNIT-2

1. Describe with suitable sketch the working of choke and idling system in case of carburetor.
2. Write short notes on the following:
   (i) Multi point fuel injection (ii) Battery ignition system.
3. Discuss the effect of variation of specific heat on power output of a spark ignition engine.
5. What are the fuel : air requirements of a carburetor at different operating conditions ? Why is float chamber vented to the atmosphere ?
6. Discuss the effect of compression ratio, Engines speed and spark advance on the knocking in SI engine.
7. Explain the working of MPFI engine.
8. Explain the meaning of ignition advance. What are the factors which affect its variation?
9. Explain the effect of engine variables on flame propagation in SI engines.

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UNIT-3

1. Show the different stages of combustion on pressure v/s crank: angle (p-θ) diagram.
2. How do the fuel quality, injection timing and compression ratio affect the knocking in diesel engine?
3. Sketch and explain the construction and working of a fuel injector' Name different types of nozzles used on it.
4. What are super charging limits for SI and CI engines
5. Describe different phases of CI engine combustion and also abnormal combustion.

UNIT-4

1. Discuss, how catalytic convertor reduces the pollutants from the engine and why unleaded petrol is required in case of catalytic convertor fitted vehicle.
2. What is the effect of supercharging on power output and fuel consumption? Why supercharging is not preferred in SI engine?
3. State the functions of lubricants in IC engine. Name the different type of lubrication systems used in engines.
4. Explain the working of thermo-syphon cooling system with neat sketch.
5. With the help of a neat sketch explain the working of a radiator.
6. What are super charging limits for SI and CI engines What are the objectives of supercharging
7. Why engine cooling is necessary.
8. Write down the physical characteristics of lubricating oil.

UNIT-5

1. What do you understand by surging and stalling in an axial flow compressor?
2. Compare centrifugal and axial compressors as to their advantages and restrictions
3. Prove that in case of reciprocating compressor the condition for minimum work per kg of air delivered by its two stage with inter cooling is achieved when intermediate pressure is geometric mean of suction pressure and final delivery pressure
4. Describe the conservation and operation of a two stage reciprocating air compressor with intercooling and also show processes on P-V diagram
6. Write short notes on

   (i) Roots blower (ii) Super charging (iii) Surging and choking.

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Printed Pages—4 EME505

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2106 Roll No.

B.Tech.

(SEM. V) ODD SEMESTER THEORY EXAMINATION 2010-11

I. C. ENGINES & COMPRESSORS

Time : 2 Hours *Total Marks : 50*

Note : (1) Attempt **all** questions.

(2) Assume suitably, any missing data.

(3) Be precise in your answer.

1. Attempt any **two** of the following : **(7×2=14)**

(a) The air flow to a four cylinder four stroke oil engine is measured by means of a 5 cm diameter orifice, having a coefficient of discharge of 0.6. During the test on the engine the following data were recorded :

Bore = 10.5 cm; stroke = 12.5 cm; Engine speed = 1200 rpm; brake torque = 14.7 Nm; time taken for 50ml fuel consumption is 25 seconds; calorific value of fuel= 43.1 MJ/kg; density of fuel =831 kg/m^3; pressure drop across orifice = 5.7 cm of water; ambient temperature and pressure were 20°C and1.013 bar respectively. Find Brake

thermal efficiency, brake mean effective pressure, brake specific fuel consumption and volumetric efficiency of the engine.

(b) (i) Compare the Otto and Diesel cycle for same maximum pressure and temperature with the help of p-V and T-s diagram.

(ii) A diesel engine having compression ratio 18 and cut off ratio of 2.53 operates on air standard cycle. The temperature and pressure of air at the beginning of compression is 30°C and 1 bar. Find air fuel ratio. The C.V. of fuel is 41 MJ/kg.

(c) (i) How the thermal efficiency vary with equivalence ratio for air standard, fuel-air and actual cycle ?

(ii) What is octane number and how is it found ?

2. Attempt any **two** of the following : **(6×2=12)**

(a) Describe with suitable sketch the working of choke and idling system in case of carburetor.

(b) What is ignition lag in SI engine ? Discuss the effect of engine variables on ignition lag.

(c) Write short notes on the following :

(i) Multi point fuel injection

(ii) Battery ignition system.

3. Attempt any **two** of the following : **(6×2=12)**

(a) Show the different stages of combustion on pressure vs crank angle (p-θ) diagram. How do the fuel quality, injection timing and compression ratio affect the knocking in diesel engine ?

(b) Explain the working of common rail injection system. A four stroke diesel engine is operating at 2400 rpm. Fuel injection starts at 20° before TDC and ends at 5° after TDC. If the quantity of fuel injected in a cycle is 40 mg, find the fuel injection rate in kg/s.

(c) Discuss, how catalytic convertor reduces the pollutants from the engine and why unleaded petrol is required in case of catalytic convertor fitted vehicle.

4. Attempt any **two** of the following : **(6×2=12)**

(a) (i) What is the effect of supercharging on power output and fuel consumption ? Why supercharging is not preferred in SI engine ?

(ii) What do you understand by surging and stalling in an axial flow compressor ?

(b) (i) State the functions of lubricants in I C engine. Name the different type of lubrication systems used in engines.

(ii) Explain the working of thermo-syphon cooling system with neat sketch.

3. Attempt any **two** of the following : **(6×2=12)**

(a) Show the different stages of combustion on pressure vs crank angle (p-θ) diagram. How do the fuel quality, injection timing and compression ratio affect the knocking in diesel engine ?

(b) Explain the working of common rail injection system. A four stroke diesel engine is operating at 2400 rpm. Fuel injection starts at 20° before TDC and ends at 5° after TDC. If the quantity of fuel injected in a cycle is 40 mg, find the fuel injection rate in kg/s.

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4. Attempt any **two** of the following : **(6×2=12)**

(a) (i) What is the effect of supercharging on power output and fuel consumption ? Why supercharging is not preferred in SI engine ?

(ii) What do you understand by surging and stalling in an axial flow compressor ?

(b) (i) State the functions of lubricants in I C engine. Name the different type of lubrication systems used in engines.

(ii) Explain the working of thermo-syphon cooling system with neat sketch.

(c) A single acting reciprocating compressor (bore = 14 cm and stroke = 10 cm) having 4% clearance gives the following data obtained from performance test. Suction pressure is 0.1 bar gauge, suction temperature 20 C, atmospheric pressure 1 bar, discharge pressure 6 bar absolute, discharge temperature 180 C, speed 1200 rpm, shaft power 6.3 kW and mass of air delivered 1.7 kg/minute. Find volumetric efficiency, isothermal efficiency and mechanical efficiency

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Printed Pages—3 EME505

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2106 Roll No.

B.Tech.

(SEM. V) THEORY EXAMINATION 2011-12

I.C. ENGINES AND COMPRESSORS

Time : 2 Hours *Total Marks : 50*

Note :— (i) Attempt **all** questions.

(ii) Be precise in your answer.

(iii) Assume suitably any relevant data, if missing.

1. Attempt any **two** parts out of the following : **(7×2=14)**

(a) A four cylinder petrol engine working on two stroke cycle develops 30 kW at 2500 rpm. The mean effective pressure on each piston is found to be 8.0 bar. The calorific value of fuel used is 43900 kJ/kg and brake thermal efficiency is 29 percent. Calculate the fuel comsumption of the engine. Further determine the bore and stroke of each cylinder, if stroke to bore ratio is 1.5. Mechanical efficiency is 80.8%.

(b) (i) For the same maximum pressure and heat input, compare Otto cycle and Diesel cycle using pressure–volume and temperature–entropy diagram.

(ii) A Diesel Engine operating on air standard cycle takes air at 1 bar pressure during suction. The pressure at the end of compression is 32.5 bar. The ratio of expansion is 6. Find thermal efficiency and Air-fuel ratio. Assume calorific value of fuel is 44 MJ/kg.

(c) (i) Discuss the effect of variation of specific heat on power output of a spark ignition engine.

(ii) How SI engine fuels are rated ?

2. Attempt any **two** parts out of the following : **(6×2=12)**

(a) What are the fuel : air requirements of a carburettor at different operating conditions ? Why is float chamber vented to the atmosphere ?

(b) (i) Discuss the effect of compression ratio, Engines speed and spark advance on the knocking in SI engine.

(ii) Explain the working of MPPI engine.

(c) (i) Explain the meaning of ignition advance. What are the factors which affect its variation ?

(ii) Sketch a labelled line diagram of a magnets ignition system.

3. Attempt any **two** parts out of the following : **(6×2=12)**

(a) Distinguish between the 'Physical ignition delay' and 'Chemical ignition delay'. Discuss the effect of different variables on ignition delay.

(b) Sketch and explain the construction and working of a fuel injector. Name different types of nozzles used on it.

(c) Discuss briefly the following :

(i) Scavenging in 2 stroke engine

(ii) Mechanism of NOx formation in Diesel Engine.

4. Attempt any **two** parts out of the following : **(6×2=12)**

(a) (i) With the help of a neat sketch explain the working of a radiator.

(ii) Compare centrifugal and axial compressors as to their advantages and restrictions.

(b) (i) What is crankcase ventilation ? What are its different types ?

(ii) What is the importance of viscosity for lubricating oils ? What are different ways to express it ?

(c) (i) What are super charging limits for SI and CI engines ?

(ii) Prove that in case of reciprocating compressor the condition for minimum work per kg of air delivered by its two stage with intercooling is achieved when intermediate pressure is geometric mean of suction pressure and final delivery pressure.

Printed Pages—4 **EME505**

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2106 Roll No.

B.Tech.

(SEM. V) ODD SEMESTER THEORY EXAMINATION 2012-13

I.C. ENGINES AND COMPRESSORS

Time : 3 Hours Total Marks : 50

Note : (1) Attempt all questions

(2) Assume suitably, any missing data.

1. Attempt any **TWO** of the following : **(7×2=14)**

(a) Answer the following :

(i) Discuss the effect of dissociation on maximum temperature and power produced by the engine in respect to the A/F ratio.

(ii) Define octane number, its importance as SI engine fuel property. What are the merits and demerits of using leaded gasoline ?

(b) Answer the following :

(i) Discuss the effect of spark advance on the performance of Otto cycle, with the help of P-V diagram.

(ii) A four stroke diesel engine is operating at 2400 r.p.m. Fuel injection starts 15° before TDC and ends at 5° after TDC. The quantity of fuel injected in a cycle is 400 mg. Find the fuel injection rate in kg/sec. If this engine works on Air Standard

Cycle and compression ratio is 20 and cut-off ratio of 1.75, find the power developed by the engine in kW.

(c) An 8-cylinder, 4-stroke SI engine of 80 mm bore and 100 mm stroke length is tested at 4500 rpm on a dynamometer. The brake torque reading of the dynamometer is 215 N-m. The time for 100 c.c. of fuel consumption is 10 seconds. Calorific value of fuel is 44 MJ/kg. The air consumption of the engine is measured by air-box method having orifice dia = 30 mm, coefficient of discharge for orifice = 0.6 and manometer reading across orifice = 18 cm of Hg column. Density of the fuel is 0.7 gm/c.c. Clearance volume of each cylinder is 65 c.c. Air is supplied to the carburettor at 1 bar and 27°C. Find the brake power, bsfc, A/F ratio, volumetric efficiency and efficiency ratio.

2. Attempt any **TWO** parts out of the following : **(6×2=12)**

(a) A single jet simple carburettor giving air-fuel ratio of 15 : 1, has venturi throat of 3.5 cm diameter, and creates depression of 6.33 cm of Hg at venturi throat. Determine the size of fuel nozzle. Assume coefficient of discharge for air and fuel = 1. Air pressure and temperature at carburettor entrance are 1.013 bar and 16°C respectively. Take density of fuel as 750 kg/m³, and fuel nozzle is at the same level as that of fuel in fuel chamber.

(b) What is meant by abnormal combustion in S.I. engine ? Explain the phenomenon of knock in S.I. engine. Sketch three combustion chambers that reduce the knocking tendencies.

(c) Why is an ignition system needed in S.I. engine ? Sketch the constructional layout of a battery ignition system and explain its working.

3. Attempt any **TWO** of the following : **(6×2=12)**

(a) What are the requirements of a C.I. fuel injection system ? Sketch a common rail injection system and explain its working.

(b) Enumerate pollutants emitted from S.I. engine. How can these pollutants be controlled ? Compare gasoline engine with a diesel engine regarding their pollution emission.

(c) Show the various stages of combustion in CI engine on the pressure-crank angle diagram. Also discuss the effect of Engine load, speed, injection timing and cetane number on the delay period in CI engine.

4. Attempt any **TWO** parts of the following : **(6×2=12)**

(a) (i) Explain the phenomenon of surging and choking of compressors.

(ii) Sketch and explain the working of a thermosyphon cooling system.

(b) (i) Briefly explain working of Root's blower. Compare it with Vane blower.

(ii) Classify various systems of engine lubrication. Explain splash lubrication system.

(c) A two stage air compressor compresses air from 17°C and 1 bar to 60 bar. The air is cooled in the intercooler to 32°C and the intermediate pressure is 7.5 bar. The L.P. Cylinder is 100 mm in diameter, 115 mm in stroke

length. Both L.P. and H.P. Cylinders have same stroke length. Assume law of compression as $PV^{1.3}$ = constant. Volume of air drawn is equal to swept volume of L.P. Cylinder at inlet conditions. Find power requirement of compressor when running at 250 rpm. Also find the diameter of H.P. Cylinder.

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B.Tech.

(SEM. V) ODD SEMESTER THEORY EXAMINATION

2010-11

I. C. ENGINES & COMPRESSORS

Time : 2 Hours *Total Marks : 50*

Note : (1) Attempt **all** questions.

(2) Assume suitably, any missing data.

(3) Be precise in your answer.

1. Attempt any **two** of the following : **(7×2=14)**

(a) The air flow to a four cylinder four stroke oil engine is measured by means of a 5 cm diameter orifice, having a coefficient of discharge of 0.6. During the test on the engine the following data were recorded :

Bore = 10.5 cm; stroke = 12.5 cm; Engine speed = 1200 rpm; brake torque = 14.7 Nm; time taken for 50ml fuel consumption is 25 seconds; calorific value of fuel= 43.1 MJ/kg; density of fuel =831 kg/m^3; pressure drop across orifice = 5.7 cm of water; ambient temperature and pressure were 20°C and1.013 bar respectively. Find Brake

thermal efficiency, brake mean effective pressure, brake specific fuel consumption and volumetric efficiency of the engine.

(b) (i) Compare the Otto and Diesel cycle for same maximum pressure and temperature with the help of p-V and T-s diagram.

(ii) A diesel engine having compression ratio 18 and cut off ratio of 2.53 operates on air standard cycle. The temperature and pressure of air at the beginning of compression is 30°C and 1 bar. Find air fuel ratio. The C.V. of fuel is 41 MJ/kg.

(c) (i) How the thermal efficiency vary with equivalence ratio for air standard, fuel-air and actual cycle ?

(ii) What is octane number and how is it found ?

Attempt any **two** of the following : **(6×2=12)**

(a) Describe with suitable sketch the working of choke and idling system in case of carburetor.

(b) What is ignition lag in SI engine ? Discuss the effect of engine variables on ignition lag.

(c) Write short notes on the following :

(i) Multi point fuel injection

(ii) Battery ignition system.

3. Attempt any **two** of the following : **(6×2=12)**

(a) Show the different stages of combustion on pressure vs crank angle (p-θ) diagram. How do the fuel quality, injection timing and compression ratio affect the knocking in diesel engine ?

(b) Explain the working of common rail injection system. A four stroke diesel engine is operating at 2400 rpm. Fuel injection starts at 20° before TDC and ends at 5° after TDC. If the quantity of fuel injected in a cycle is 40 mg, find the fuel injection rate in kg/s.

(c) Discuss, how catalytic convertor reduces the pollutants from the engine and why unleaded petrol is required in case of catalytic convertor fitted vehicle

4. Attempt any **two** of the following : **(6×2=12)**

(a) (i) What is the effect of supercharging on power output and fuel consumption ? Why supercharging is not preferred in SI engine ?

(ii) What do you understand by surging and stalling in an axial flow compressor ?

(b) (i) State the functions of lubricants in I C engine. Name the different type of lubrication systems used in engines.

(ii) Explain the working of thermo-syphon cooling system with neat sketch.

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(c) A single acting reciprocating compressor (bore = 14 cm and stroke = 10 cm) having 4% clearance gives the following data obtained from performance test. Suction pressure is 0.1 bar gauge, suction temperature 20 C, atmospheric pressure 1 bar, discharge pressure 6 bar absolute, discharge temperature 180 C, speed 1200 rpm, shaft power 6.3 kW and mass of air delivered 1.7 kg/minute. Find volumetric efficiency, isothermal efficiency and mechanical efficiency.

Printed Pages—3

EME505

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2106 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. V) THEORY EXAMINATION 2011-12

I.C. ENGINES AND COMPRESSORS

Time : 2 Hours *Total Marks : 50*

Note :— (i) Attempt **all** questions.

(ii) Be precise in your answer.

(iii) Assume suitably any relevant data, if missing.

1. Attempt any **two** parts out of the following : **(7×2=14)**

(a) A four cylinder petrol engine working on two stroke cycle develops 30 kW at 2500 rpm. The mean effective pressure on each piston is found to be 8.0 bar. The calorific value of fuel used is 43900 kJ/kg and brake thermal efficiency is 29 percent. Calculate the fuel comsumption of the engine. Further determine the bore and stroke of each cylinder, if stroke to bore ratio is 1.5. Mechanical efficiency is 80.8%.

(b) (i) For the same maximum pressure and heat input, compare Otto cycle and Diesel cycle using pressure–volume and temperature–entropy diagram.

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(ii) A Diesel Engine operating on air standard cycle takes air at 1 bar pressure during suction. The pressure at the end of compression is 32.5 bar. The ratio of expansion is 6. Find thermal efficiency and Air-fuel. ratio. Assume calorific value of fuel is 44 MJ/kg.

(c) (i) Discuss the effect of variation of specific heat on power output of a spark ignition engine.

(ii) How SI engine fuels are rated ?

2. Attempt any **two** parts out of the following : **(6×2=12)**

(a) What are the fuel : air requirements of a carburettor at different operating conditions ? Why is float chamber vented to the atmosphere ?

(b) (i) Discuss the effect of compression ratio, Engines speed and spark advance on the knocking in SI engine.

(ii) Explain the working of MPPI engine.

(c) (i) Explain the meaning of ignition advance. What are the factors which affect its variation ?

(ii) Sketch a labelled line diagram of a magnets ignition system.

3. Attempt any **two** parts out of the following : **(6×2=12)**

(a) Distinguish between the 'Physical ignition delay' and 'Chemical ignition delay'. Discuss the effect of different variables on ignition delay.

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(b) Sketch and explain the construction and working of a fuel injector. Name different types of nozzles used on it.

(c) Discuss briefly the following :

(i) Scavenging in 2 stroke engine

(ii) Mechanism of NOx formation in Diesel Engine.

4. Attempt any **two** parts out of the following : **(6×2=12)**

(a) (i) With the help of a neat sketch explain the working of a radiator.

(ii) Compare centrifugal and axial compressors as to their advantages and restrictions.

(b) (i) What is crankcase ventilation ? What are its different types ?

(ii) What is the importance of viscosity for lubricating oils ? What are different ways to express it ?

(c) (i) What are super charging limits for SI and CI engines ?

(ii) Prove that in case of reciprocating compressor the condition for minimum work per kg of air delivered by its two stage with inercooling is achieved when intermediate pressure is geometric mean of suction pressure and final delivery pressure.

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(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2106 Roll No. | | | | | | | | | | |

B.Tech

(SEMESTER-V) THEORY EXAMINATION, 2012-13

I.C. ENGINES & COMPRESSORS

Time : 2 Hours] *[Total Marks : 50*

Note : (1) Use illustrations, wherever needed.

(2) In case of missing data assume missing data, suitably and state the assumption made.

Section – A

1. Attempt **all** questions in this section : $5 \times 2 = 10$

(i) Which are the alternative fuels that can be used in I.C. engines ?

(ii) What is meant by valve timing diagram ?

(iii) Obtain the expression of air standard efficiency of a diesel cycle.

(iv) What are the objectives of supercharging ?

(v) What is meant by surging in compressors ?

Section – B

2. Attempt any **three** parts : $5 \times 3 = 15$

(a) (i) Describe classification of I.C. engines. 5

(ii) Discuss the desirable properties of IC engine fuels.

(b) Describe the phenomenon of knocking in SI engines and the effects of knocking on engine performance. 5

(c) Describe different phases of CI engine combustion and also abnormal combustion. 5

(d) Describe the operation of water cooling system used in IC engines with schematic arrangement. 5

(e) Describe the conservation and operation of a two stage reciprocating air compressor with intercooling and also show processes on P-V diagram. 5

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Section – C

Attempt **all** questions in this section : $5 \times 5 = 25$

3. Attempt any **two** parts :

(a) During a test of a single cylinder four-stroke oil engine a rope brake dynamometer is used to measure the output of the engine. The details of the test are

Cylinder diameter	= 250 mm
Stroke length	= 400 mm
Gross mep	= 7 bar
Pumping mep	= 0.5 bar
Engine speed	= 250 rpm
Net load on the brake	= 1080 N
Effective diameter of the brake	= 1.5 m
Fuel used per hour	= 10 kg
Calorific value of fuel	= 44300 kJ/kg

Calculate :

(i) Indicated power

(ii) Brake power

(iii) Mechanical efficiency

(iv) Indicated thermal efficiency

(b) Explain the effect of engine variables on flame propagation in SI engines.

(c) Describe the two basic methods of generating air swirl in CI engine combustion chambers.

4. Attempt any **one** part :

(a) An IC engine working on diesel cycle has a bore of 150 mm and stroke of 250 mm respectively. If the clearance volume is 0.0004 m^3 and fuel injection takes place at constant pressure for 5 percent of the stroke, determine the thermal efficiency of the engine.

(b) Define Octane number and describe the motor method and the research method of determining octane number of a fuel.

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5. Attempt any **one** part :

(a) Describe the different constituents which are exhausted from SI engine and the different factors which affect the amount of these constituents.

(b) Describe any two methods of ignition systems used in IC engine with their Schematic arrangement.

6. Describe the operation of any two types of modern fuel injection systems with sketch. Also explain working of Pintle nozzle & Pintaux nozzle.

7. Attempt any **one** parts :

(a) Describe the features of an IC engine working on sterling cycle.

(b) Describe any one type of combustion chamber for SI engine and its merits.

(c) Describe any one type of supercharging arrangements for IC engine and its application.

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Printed Pages—2 **EME505**

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2106 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. V) ODD SEMESTER THEORY EXAMINATION 2013-14

IC ENGINES AND COMPRESSORS

Time :2 Hours *Total Marks : 50*

Note : Attempt **ALL** the questions.

1. Attempt any ***two*** questions :— **(7×2=14)**

   (a) Explain the difference between two stroke and four stroke engines. Draw the actual valve timing diagram for a 4 stroke and 2 stroke S.I. Engine.

   (b) Discuss the effects of gasoline volatility on cold starting, hot starting, warm up and vapour lock. What is performance number and diesel index ?

   (c) Following data was obtained during the trial of two cylinders, 2 stroke engine :
   Bore 10 cm, stroke 14 cm, speed 1500 rpm, Area of the positive and negative loop are 6 cm^2 and 0.25 cm^2 respectively. Length of indicator diagram is 6 cm, spring constant of indicator is 3.8 bar/cm. Net brake load on the dynamometer is 237.5 N, Brake drum radius is 0.4 m. Fuel consumption is 4.7 kg/hr, calorific value of fuel 45000 kJ/kg. Find indicated power, brake power, mechanical and thermal efficiencies.

2. Attempt any ***two*** questions :— **(6×2=12)**

   (a) Explain the stages of combustion in S.I. Engine. Explain the terms flame speed and ignition delay.

(b) Discuss the effect of following engine variables on S.I. engine performance :

   (i) Compression ratio

   (ii) Ambient pressure and temperature

   (iii) Air-fuel ratio

   (iv) Turbulence.

   (c) Explain the construction and working of simple carburettor in a S.I. engine. Explain the carburetion by compensating jet method with sketch.

3. Attempt any ***two*** questions :— **(6×2=12)**

   (a) What is ignition delay in case of C.I. engines ? Discuss the variables affecting ignition delay.

   (b) Explain the types of fuel injection systems in diesel engine.

   (c) What are the types of combustion chamber used in C.I. engines ?

4. Attempt any ***two*** questions :— **(6×2=12)**

   (a) Differentiate between centrifugal compressor and axial flow compressor.

   (b) Show advantages of multistage compression with help of PV and TS diagram. Derive optimum pressure ratio for 2 stage minimum work of compression.

   (c) Write short notes on any ***two*** :

   (i) Roots blower

   (ii) Supercharging

   (iii) Surging and choking.

   (iv) Radiator.

Printed Pages : 3

EME-505

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 140505

Roll No.

B. Tech.

(SEM. V) (ODD SEM.) THEORY EXAMINATION, 2014-15

IC ENGINES & COMPRESSORS

Time : 2 Hours] [Total Marks : 50

Note : All questions carry equal marks.

1 Attempt any four parts :

a) Compare Otto, Diesel and Dual cycles for the

I. same compression ratio and heat input

II. same maximum pressure and temperature

b) Discuss the use of LPG as SI Engine fuel.

c) Discuss variables effecting the delay period.

d) Write short notes on diesel knock and its control.

e) Sketch and explain working principle of a typical thermostat used in engine cooling system

f) Write short notes on Surging and stalling.

2 Attempt any two parts :

a) Following data relates to 4 cylinders, 2 stroke petrol engine. Air/Fuel ratio by weight 16:1. Calorific value of the fuel = 45200 kJ/kg, Mechanical efficiency = 82%. Air standard efficiency = 52%, Relative efficiency =70%, Volumetric efficiency = 78%, Stroke/bore ratio = 1.25, Suction conditions = 1 bar, 25°C Speed = 2400 rpm, Power at brakes of 72 kW. Calculate

I. Compression ratio.

II. Brake specific fuel consumption

III. Bore and stroke.

b) A single cylinder four stroke diesel engine working on dual combustion cycle has a compression ratio of 15:1. The engine draws in air at 1bar, 27°C and the maximum pressure in the cylinder is limited to 55 bar. If the heat transfer at constant volume is twice that at constant pressure, determine

I. Constant volume pressure ratio

II. Cut off ratio

III. Thermal efficiency of the cycle

Assume C_p=1.005 k J/kg.K, C_v = 0.718 k J/kg.K and γ = 1.4.

c) Discuss the important qualities of an SI and CI engine fuel.

d) Explain the construction and working of a root blower and axial flow compressor with a neat sketch.

3 Attempt any two parts :

a) Discuss the general principles of SI engine combustion chamber design.

b) Explain why simple carburetor cannot meet the various engine requirements.

c) List various Electronic ignition systems in use. Describe any one of them clearly stating its advantages over the conventional ignition system.

d) Briefly explain the various methods of supercharging an engine.

4 Attempt any two parts :

a) Sketch some important designs of open combustion chamber for CI engines.

b) How are the injection system classified ? Describe them briefly. Why the air injection system is not used nowadays ?

c) Explain the stages of combustion in a CI Engine

d) What is meant by Crankcase ventilation ? Explain the details.

Printed Pages: 3 | 237 | NME-505

(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 140505 Roll No. | | | | | | | | | |

B.Tech.

(SEM. V) THEORY EXAMINATION, 2015-16

I.C. ENGINES & COMPRESSORS

[Time:3 hours] [Maximum Marks: 100

Section-A

Q.1 Attempt all parts. All parts carry equal marks. Write answer of each part in short. (2×10=20)

(a) State two differences between two stroke & Four Stroke Engines.

(b) Write the name of various fuels used in IC Engines.

(c) What is octane & Cetane Number?

(d) Mention different types of combustion chamber used in SL engines.

(e) What is the difference in between reciprocating & centrifugal compressor?

(f) Write the formula for efficiency of Otto and Diesel cycle.

(g) Draw P-v & T-s diagram for Air Standard Ericsson cycle

(h) What are the major pollutants in exhaust emission?

(i) State various types of injection System.

(j) What do you mean by blow by losses?

Section-B

Attempt any five questions from this section. 10×5=50

Q2. Compare Otto, Diesel and Dual cycles for the

a) Same compression ratio and heat input

b) Same maximum pressure and temperature

Q3. a) Write short notes on Surging and stalling.

b) Write short notes on diesel knock and its control.

Q4. Following data relates to 4 cylinders, 2 stroke petrol engine. Air/ Fuel ratio by weight 16:1. Calorific value of the fuel: 45200 kj/kg, Mechanical efficiency =82%. Air standard efficiency = 52%, Relative efficiency =70%, Volumetric efficiency = 78%, Stroke/bore ratio= 1.25, Suction condition: 1 bar, 25°C Speed = 2400 rpm, Power at brakes of 72 kW. Calculate

i) Compressopm ratio

ii) Brake specific fuel consumption m.

iii) Bore and stroke.

Q5. Derive an expression for the efficiency of a Dual Cycle with P-V & T-S Diagram.

Q6. Why engine cooling is necessary. Explain the working of thermo-syphon cooling system with neat sketh.

Q7. Prove that for two stage compressors, the work done on one kg of air is minimum with perfect intercooling when the intemediate pressure is geometric mean of the suction and delivery pressures.

$P_i = \sqrt{P_s P_d}$

Where P_s = Suction pressure

P_d = Delivery pressure.

Q8. What are the advantages of supercharging? Explain the effect of altitude on power output.

Q9. What is the main function of a spark plug? Draw a neat sketch and explain its various parts.

Section-C

Attempt any two questions from this section.

(15×2=30)

Q10.(a) How are the injection system classified? Describe them briefly. Why the air injection system is not used now days?

(b) Explain the stages of combustion in a C.I engine.

Q11.(a) Explain the construction and working of a root blower and axial flow compressor with a neat sketch.

(b) Sketch and explain working principle of typical thermostat usu in engine cooling system.

Q12. (a) What do you mean by combustion? List and explain various stages of combustion in CI engines.

(b) Discuss the effect of following

i) Effect of engine speed and load on flame propagation in SI engine.

ii) Effect of spark timing, engine load & compression ratio on detonation in SI engine.

—x—

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Printed Pages: 3 NME-505

(Following Paper ID and Roll No. to be filled in your Answer Books)

Paper ID : 2012258 Roll No. | | | | | | | | | |

B.TECH.

Regular Theory Examination (Odd Sem - V), 2016-17

I.C. Engines & Compressors

Time : 3 Hours *Max. Marks : 100*

Section - A

Note: **Attempt all parts. All parts carry equal marks. Write answer of each part in short. (10×2=20)**

1 a) Define compression Ratio.

b) Compare SI and CI Engine with respect to Compression ratio & Ignition.

c) Why a rich mixture is required for maximum power?

d) What is supercharging in a IC engine?

e) Define ignition delay.

f) What is the cause for diesel smoke?

g) List the use of LPG as SI Engine fuel.

h) What is the significance of flash and fire points of a lubricant?

i) Differentiate between single stage and multi stage air compressor.

j) Define volumetric efficiency.

Section - B

Note: Attempt any five questions from this section (5×10=50)

2. An amount of a perfect gas has initial condition of volume 1 m^3, pressure 1 bar and temperature 18°C. It undergoes ideal diesel cycle operation, the pressure after isentropic compression being 50 bar and the volume after constant pressure expansion being 0.1 m^3. Calculated the temperature at the major point of the cycle and evaluate the thermal efficiency of diesel cycle.

3. Briefly explain with a neat sketch the operation of a simple float type carburetor.

4. Describe high tension magneto ignition system with a neat sketch.

5. Explain the stages of combustion in a CI Engine.

6. How are the injection system classified? Describe them briefly.

7. A six cylinder, 4 stroke SI engine having a piston displacement of 700 cm^3 per cylinder developed 78 kW at 3200 rpm and consumed 27 kg of petrol per hour. The calorific value of petrol is 44 MJ/kg. Estimate

   a) Volumetric efficiency of the engine if the air fuel ratio is 12 and intake air is at 0.9 bar, 32°C.

   b) Brake thermal efficiency and

   c) Braking torque.

8. A single stage single acting reciprocating air compressor has a bore of 200 mm and a stroke of 300 mm. It receives air at 1 bar and 20°c delivered it at 5.5 bar. If the compression follows the $pv^{1.3}=C$ and clearance volume is 5% of stroke volume, determine :

   a) Mean effective pressure,

   b) Power to drive the compressor, if it runs at 500 rpm.

9. Describe with a neat sketch the working principle of vane blower.

Section - C

Note: Attempt any two questions from this section (2×15=30)

10. a) Explain the significance of fuel air cycle. **(5)**

    b) Compare the following :

       i) Two stroke and four stroke engine.

       ii) Otto, diesel & dual cycle. **(10)**

11. a) Explain the stages of combustion in SI Engine. **(7)**

    b) Sketch some important designs of open combustion chamber for CI engines. **(8)**

12. Discuss Engine cooling and lubrication systems in detail with required sketches. **(20)**

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MORADABAD INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
Session-2019-20
Question Bank

Course : B. Tech **Semester : 5th**

Subject : - IC Engine & Compressors **Subject Code:RME-051**

UNIT-1

1. Define Engine.
2. What is meant by valve timing diagram?
3. Obtain the expression of air standard efficiency of a diesel cycle.
4. Describe classification of I.C. engines.
5. Explain the difference between two stroke and four stroke engines. Draw the actual valve timing diagram for a 4 stroke and 2 stroke S.I. Engine.
6. Discuss the use of LPG as SI engine Fuel.
7. Write the various fuels used in IC engines.
8. What is Octane & Cetane Number.
9. Write down the formula of efficiency of Otto & Diesel Cycle.
10. Draw the p-v & T-s Diagram of air standard Ericsson Cycle.
11. Define Compression Ratio.
12. Compare SI & CI engine with respect to Compression ratio & Ignition.
13. Why Rich mixture is required for maximum power.
14. Explain the Significance of fuel air cycle.
15. Compare the Otto and Diesel cycle for same maximum pressure and temperature with the help of p-V and T-s diagram.
16. A diesel engine having compression ratio 18 and cutoff ratio of 2.53 operates on air standard cycle. The temperature and pressure of air at the beginning of compression is 30°C and 1 bar. Find air fuel ratio. The C.V of fuel is 41 MJ/kg.
17. How the thermal efficiency vary with equivalence ratio for air standard, fuel-air and actual cycle?
18. What is octane number and how is it found.

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Deptt. of Mechanical Engg.
Moradabad Institute of Technology

19. For the same maximum pressure and heat input, compare Otto cycle and Diesel cycle using pressure-volume and temperature-entropy diagram.
20. A Diesel Engine operating on air standard cycle takes air at I bar pressure during suction. The pressure at the end of compression is 32.5 bar. The ratio of expansion is 6. Find thermal efficiency and Air-fuel ratio. Assume calorific value of fuel is 44 MJ/kg.
21. What is meant by valve timing diagram?
22. Discuss the desirable properties of IC engine fuels
23. Explain the difference between two stroke and four stroke engines. Draw the actual valve timing diagram for a 4 stroke and 2 stroke S.I. Engine.

UNIT-2

1. Describe with suitable sketch the working of choke and idling system in case of carburetor.
2. What is ignition lag in SI engine? Discuss the effect of engine variables on ignition lag.
3. Write short notes on the following:
   (i) Multi point fuel injection (ii) Battery ignition system.
4. Discuss the effect of variation of specific heat on power output of a spark ignition engine.
5. What are the fuel : air requirements of a carburetor at different operating conditions ? Why is float chamber vented to the atmosphere ?
6. Discuss the effect of compression ratio, Engines speed and spark advance on the knocking in SI engine.
7. Explain the working of MPFI engine.
8. Explain the meaning of ignition advance. What are the factors which affect its variation?
9. Explain the effect of engine variables on flame propagation in SI engines.
10. Define Octane number and describe the motor method and the research method to determining octane number of a fuel.
11. Describe the different constituents which are exhausted from SI engine and the different factors which affect the amount of these constituents.
12. Describe any two methods of ignition systems used in IC engine with their Schematic arrangement.
13. Describe any one type of combustion chamber for SI engine and its merits.

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14. Explain the stages of combustion in S.I. Engine. Explain the terms flame speed and ignition delay
15. Discuss the effect of following engine variables on S.I engine performance :
    (i) Compression ratio
    (ii) Ambient pressure and temperature
    (iii) Air-fuel ratio
    (iv) Turbulence.
16. Explain the construction and working of simple carburettor in a S.I. engine.
17. Explain the carburetion by compensating jet method with sketch.
18. Discuss the general principles of SI combustion chamber design.
19. Explain why simple carburetor cannot meet the various engine requirements.
20. Briefly explain the various methods of supercharging an engine.
21. What are the objectives of supercharging
22. What are the fuel : air requirements of a carburettor at different operating conditions
23. Why is float chamber vented to the atmosphere
24. What is the effect of supercharging on power output and fuel consumption ? Why Super charging is not preferred in SI engine.
25. Discuss brief the following:
    (i) Scavenging in 2 stroke engine
    (ii) Mechanism of NOx formation in Diesel Engine
26. What is the main function of spark plug . Draw a neat sketch and explain its various parts.

UNIT-3

1. Show the different stages of combustion on pressure v/s crank: angle (p-θ) diagram.
2. How do the fuel quality, injection timing and compression ratio affect the knocking in diesel engine?
3. Explain the working of common rail injection system. A four stroke diesel engine is operating at 2400 rpm. Fuel injection starts at 20° before IDC and ends at 5° after IDC. If the quantity of fuel injected in a cycle is 40 mg, Find the fuel injection rate in kg/sec.

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4. Distinguish between the 'Physical ignition delay' and 'Chemical ignition delay'. Discuss the effect of different variables on ignition delay.
5. Sketch and explain the construction and working of a fuel injector' Name different types of nozzles used on it.
6. What are super charging limits for SI and CI engines
7. Describe different phases of CI engine combustion and also abnormal combustion.
8. Describe the two basic methods of generating air swirl in CI engine combustion chambers.
9. Describe the operation of any two types of modern fuel injection systems with sketch. Also explain working of pintle nozzle & pintaux nozzle
10. Describe the features of an IC engine working on sterling cycle.
11. Describe any one type of supercharging arrangements for IC engine and its application.
12. What is ignition delay in case of C.I. engines? Discuss the variables affecting ignition delay.
13. Explain the types of fuel injection systems in diesel engine.
14. What are the types of combustion chamber used in C.I. engines ?
15. Sketch some important designs of open combustion chamber for CI engines.
16. How are the injection system classified. Describe them briefly. Why the air injection system is not used nowadays.
17. What is meant by Crankcase ventilation? Explain the details.

UNIT-4

1. Discuss, how catalytic convertor reduces the pollutants from the engine and why unleaded petrol is required in case of catalytic convertor fitted vehicle.
2. What is the effect of supercharging on power output and fuel consumption? Why supercharging is not preferred in SI engine?
3. State the functions of lubricants in IC engine. Name the different type of lubrication systems used in engines.
4. Explain the working of thermo-syphon cooling system with neat sketch.

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Moradabad - 244001

5. With the help of a neat sketch explain the working of a radiator.

6. What is the importance of viscosity for lubricating oils ? What are different ways to express it ?
7. What are super charging limits for SI and CI engines What are the objectives of supercharging
8. Describe the operation of water cooling system used in IC engine with schematic arrangement
9. Describe any one type of supercharging arrangements for IC engine and its application.
10. Sketch and explain working principle of a typical thermostat used in engine cooling system
11. Why engine cooling is necessary.
12. Write down the physical characteristics of lubricating oil.

UNIT-5

1. What do you understand by surging and stalling in an axial flow compressor?
2. A single acting reciprocating compressor (bore = 14 cm and stroke = 10 cm) having 4% clearance gives the following data obtained from performance test. Suction pressure is 0.1 bar gauge, suction temperature 20 C, atmospheric pressure 1 bar, discharge pressure 6 bar absolute, discharge temperature 180 C, speed 1200 rpm, shaft power 6.3 kW and mass of air delivered 1.7 kg/minute. Find volumetric efficiency, isothermal efficiency and mechanical efficiency.
3. Compare centrifugal and axial compressors as to their advantages and restrictions
4. Prove that in case of reciprocating compressor the condition for minimum work per kg of air delivered by its two stage with inter cooling is achieved when intermediate pressure is geometric mean of suction pressure and final delivery pressure
5. Describe the conservation and operation of a two stage reciprocating air compressor with intercooling and also show processes on P-V diagram
6. Write short notes on

   (i) Roots blower (ii) Super charging (iii) Surging and choking.

PAGE No
DATE : / /201

To,
The HOD (M.E.),
MIT Moradabad,

Date :- 22/10/19

Subject:- For Attendance.

Respected Sir,

This is to inform that the 3rd year student who were attending the 3 days E.A.C program have to be given attendance for their respective classes held on 18/10/19 to 19/10/19.

Following are the names of the students :-

1.) Rishabh Goel (M.E. 3rd year)
2.) Aman Khan " "
3.) Prashant Chaudhary " "
4.) Sidhanth
5.) Vivek

Note: kindly include other students name as well.

6.) Ashutosh Kumar
7.) Kabir
8.) Yogendra.

forwarded for consideration
22/10/19

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Moradabad Institute of Technology (082)
Department of Mechanical Engineering

Subject name and code : **RME-051 IC Engine & Compressor** **Semester:** **5th**

Section-E

S.N.	Student name	Roll No.	CT-1	CT-2	CT-3	Makeup	CT- Total(Best Two)	TA	AT	Total
			20	20	20	20	MM:20	MM:05	MM:05	MM:30
1	ABHINAV GUPTA	1708240003	16	16	18		17	5	5	27
2	ABHISHEK CHANDRA	1708240005	9	16	18		17	5	5	27
3	ADITYA SHARMA	1708240006	4	12	5		9	5	5	19
4	AKSHAT DABAS	1708240008	12	15	4		14	5	5	24
5	AMBESH KUMAR PAL	1708240011	A	9	8		9	5	5	19
6	ANAS BEIG	1708240012	A	A	A	20	10	5	4	19
7	ANKIT KUMAR GANGWAR	1708240013	3	9	9		9	5	5	19
8	ANUJ	1708240014	A	17	A		9	5	5	19
9	ANURAG JOSHI	1708240015	8	13	11		12	5	5	22
10	ASHEESH KUMAR	1708240018	A	5	A	15	10	5	4	19
11	ASHUTOSH BHARDWAJ	1708240019	A	10	5	10	10	5	4	19
12	AYUSH KUMAR	1708240021	A	A	A	20	10	5	4	19
13	LALIT KUMAR	1708240026	7	A	A	15	11	4	4	19
14	MANJEET SINGH	1708240028	A	A	A	20	10	5	4	19
15	MOHD. SAMAD KHAN	1708240035	A	1	A	19	10	5	4	19
16	PRASHANT CHAUDHARY	1708240039	15	11	A		13	5	5	23
17	PRATEEK KUMAR	1708240040	9	12	A		11	5	4	20
18	RAJVEER SAINI	1708240041	9	9	A		9	5	5	19
19	RISHABH GOEL	1708240043	16	13	A		15	5	5	25
20	SARTHAK DIXIT	1708240048	9	A	A	13	11	5	5	21
21	SHASHI PRAKASH	1708240049	A	A	12	10	11	4	4	19
22	SIRAJ AHMAD	1708240053	A	A	A	20	10	5	4	19
23	SUNEEL KUMAR	1708240057	A	11	A	11	11	5	5	21
24	RAJNISH CHAUHAN	1608240067	A	A	A	20	10	5	4	19
25	RAJAT SAINI	1608240066	A	2	A	16	9	5	5	19

Name and Signature of Subject Teacher with date

Dr. Munish Chhabra
Professor & Head
Deptt. of Mechanical Engg.
of Technology

Signature of HOD

FINAL

Moradabad Institute of Technology (082)

Department of Mechanical Engineering

Subject name and code : RME-051 IC Engine & Compressor **Semester:** 5th

Section-E

S.N.	Student name	Roll No.	CT-1	CT-2	CT-3	Makeup	CT- Totai(Best Two)	TA	AT	Total
			20	20	20	20	MM:20	MM:05	MM:05	MM:30
1	ABHINAV GUPTA	1708240003	16	16	18		17	5	5	27
2	ABHISHEK CHANDRA	1708240005	9	16	18		17	5	5	27
3	ADITYA SHARMA	1708240006	4	12	5		9	5	5	19
4	AKSHAT DABAS	1708240008	12	15	4		14	5	5	24
5	AMBESH KUMAR PAL	1708240011	A	9	8		9	5	5	19
6	ANAS BEIG	1708240012	A	A	A	19	10	5	4	19
7	ANKIT KUMAR GANGWAR	1708240013	3	9	9		9	5	5	19
8	ANUJ	1708240014	A	17	A		9	5	5	19
9	ANURAG JOSHI	1708240015	8	13	11		12	5	5	22
10	ASHEESH KUMAR	1708240018	A	5	A	15	10	5	4	19
11	ASHUTOSH BHARDWAJ	1708240019	A	10	5	10	10	5	4	19
12	AYUSH KUMAR	1708240021	A	A	A	19	10	5	4	19
13	LALIT KUMAR	1708240026	7	A	A	15	11	4	4	19
14	MANJEET SINGH	1708240028	A	A	A	19	10	5	4	19
15	MOHD. SAMAD KHAN	1708240035	A	1	A	19	10	5	4	19
16	PRASHANT CHAUDHARY	1708240039	15	11	A		13	5	5	23
17	PRATEEK KUMAR	1708240040	9	12	A		11	5	4	20
18	RAJVEER SAINI	1708240041	9	9	A		9	5	5	19
19	RISHABH GOEL	1708240043	16	13	A		15	5	5	25
20	SARTHAK DIXIT	1708240048	9	A	A	13	11	5	5	21
21	SHASHI PRAKASH	1708240049	A	A	12	10	11	4	4	19
22	SIRAJ AHMAD	1708240053	A	A	A	19	10	5	4	19
23	SUNEEL KUMAR	1708240057	A	11	A	11	11	5	5	21
24	RAJNISH CHAUHAN	1608240067	A	A	A	19	10	5	4	19
25	RAJAT SAINI	1608240066	A	2	A	16	9	5	5	19

Name and Signature of Subject Teacher with date

18/12/19

Dr. Munish Chhabra
Professor & Head
Deptt. of Mechanical Engg.
Moradabad Institute of Technology

Signature of HOD

डा0 ए0पी0जे0 अब्दुल कलाम प्राविधिक विश्वविद्यालय, उत्तर प्रदेश, लखनऊ

Dr. A.P.J. Abdul Kalam Technical University, Uttar Pradesh, Lucknow

(Formerly Uttar Pradesh Technical University)

Sessional Marks Examination (सैत्रिक अंक)

Sessional Brief (सैत्रिक संक्षिप्त)

Institute Code & Name	:	MORADABAD INSTITUTE OF TECHNOLOGY,MORADABAD(082)
Course Code & Name	:	B.Tech
Branch Code & Name	:	Mechanical Engineering
Semester	:	5
FacultyName	:	Deepak Singh
SubjectCode	:	RME051
Marks Type	:	
Is Finally Submitted to University	:	**False** (* will be **TRUE** after submitting to university by your college.)

Print (प्रिंट करें)

Sessional Marks (सैत्रिक अंक)

Sr.no. (क्रम संख्या)	Roll No. (अनुक्रमांक)	Name (नाम)	Obt.(CT) प्राप्त (CT)	Max.(CT) अधिकतम (CT)	Obt. TA (Assign./Att.)	Max. TA (Assign./Att.)	Obt. CT+TA	Max. CT+TA	Remark (टिप्पणी)
1	1608240066	RAJAT SAINI	9	20	10	10	19	30	
2	1608240067	RAJNISH CHAUHAN	10	20	9	10	19	30	
3	1708240003	ABHINAV GUPTA	17	20	10	10	27	30	
4	1708240005	ABHISHEK CHANDRA	17	20	10	10	27	30	
5	1708240006	ADITYA SHARMA	9	20	10	10	19	30	
6	1708240008	AKSHAT DABAS	14	20	10	10	24	30	
7	1708240011	AMBESH KUMAR PAL	9	20	10	10	19	30	
8	1708240012	ANAS BEIG	10	20	9	10	19	30	
9	1708240013	ANKIT KUMAR GANGWAR	9	20	10	10	19	30	
10	1708240014	ANUJ	9	20	10	10	19	30	
11	1708240015	ANURAG JOSHI	12	20	10	10	22	30	
12	1708240018	ASHEESH KUMAR	10	20	9	10	19	30	
13	1708240019	ASHUTOSH BHARDWAJ	10	20	9	10	19	30	
14	1708240021	AYUSH KUMAR	10	20	9	10	19	30	
15	1708240026	LALIT KUMAR	11	20	8	10	19	30	
16	1708240028	MANJEET SINGH	10	20	9	10	19	30	
17	1708240035	MOHD. SAMAD KHAN	10	20	9	10	19	30	
18	1708240039	PRASHANT CHAUDHARY	13	20	10	10	23	30	
19	1708240040	PRATEEK KUMAR	11	20	9	10	20	30	
20	1708240041	RAJVEER SAINI	9	20	10	10	19	30	
21	1708240043	RISHABH GOEL	15	20	10	10	25	30	
22	1708240048	SARTHAK DIXIT	11	20	10	10	21	30	
23	1708240049	SHASHI PRAKASH	11	20	8	10	19	30	
24	1708240053	SIRAJ AHMAD	10	20	9	10	19	30	
25	1708240057	SUNEEL KUMAR	11	20	10	10	21	30	

Director's Signature

Faculty Signature

Dr. Munish Chhabra
Professor & Head
Deptt. of Mechanical Engg.
Moradabad Institute of Technology
[illegible] - 244001

डा0 एपी0जे0 अब्दुल कलाम प्राविधिक विश्वविद्यालय, उत्तर प्रदेश, लखनऊ
Dr. A.P.J. Abdul Kalam Technical University, Uttar Prades[illegible] Luckno[illegible]

(Formerly Uttar Pradesh Technical University)

Sessional Marks Examination (सैत्रिक अंक)

Sessional Brief (सैत्रिक संक्षिप्त)

Institute Code & Name	:	MORADABAD INSTITUTE OF TECHNOLOGY,MORADABAD(082)
Course Code & Name	:	B.Tech
Branch Code & Name	:	Mechanical Engineering
Semester	:	5
Faculty Name	:	Deepak Singh
SubjectCode	:	RME051
Marks Type	:	
Is Finally Submitted to University	:	[illegible] TRUE [illegible] university by your college.)

Sessional Marks (सैत्रिक अंक)

Sr.no. (क्रम संख्या)	Roll No. (अनुक्रमांक)	Name (नाम)	Obt.(CT) प्राप्त (CT)	Max.(CT) अधिकतम (CT)	Obt. TA (Assign./Att.)	Max. TA (Assign./Att.)	Obt. CT+TA	Max. CT+TA	Remark
1	1608240066	RAJAT SAINI	9	20	10	10	19	30	
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4	1708240005	ABHISHEK CHANDRA	17	20	10	10	27	30	
5	1708240006	ADITYA SHARMA	9	20	10	10	19	[illegible]	
6	1708240008	AKSHAT DABAS	14	20	10	10	24	30	
7	1708240011	AMBESH KUMAR PAL	9	20	10	10	19	30	
8	1708240012	ANAS BEIG	10	20	9	10	19	30	
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14	1708240021	AYUSH KUMAR	10	20	9	10	19	30	
15	1708240026	LALIT KUMAR	11	20	8	10	19	[illegible]	
16	1708240028	MANJEET SINGH	10	20	9	10	19	30	
17	1708240035	MOHD. SAMAD KHAN	10	20	9	10	19	30	
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Director's Signature

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Moradabad - 244001

Course Name	IC Engine and Compressors
Course Code	RME051
Batch	2017 2021
Semester	5
Session	2019 2020
L:T:P	3.1.0

CO Attainment Gap

Course Code	CO	CO Targets	CO Attainment	CO Attainm
RME051	CO1	60	66.23	-6.23
	CO2	60	66.23	-6.23
	CO3	60	66.23	-6.23
	CO4	60	66.23	-6.23
	CO5	60	66.23	-6.23

Closure of Quality Loop

Course Code	CO	CO Targets	CO Attainment Gap	Action propose d to	Modification of targets where Achieved
RME051	CO1	60	-6.23		Target is increased to 70%
	CO2	60	-6.23		Target is increased to 70%
	CO3	60	-6.23		Target is increased to 70%
	CO4	60	-6.23		Target is increased to 70%
	CO5	60	-6.23		Target is increased to 70%

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