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B.TECH.
(SEM-V) THEORY EXAMINATION 2021-22
AUTOMOBILE ENGINES & COMBUSTION

Time: 3 Hours**Total Marks: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

- 1. Attempt all questions in brief. 2 x 10 = 20**
- a. Explain the term Heat Engine.
 - b. Discuss the term “Relative efficiency”.
 - c. What is the burning velocity of fuel?
 - d. Explain squish, swirl and tumble air movement.
 - e. Define ignition limits.
 - f. Explain the term “MPFI” in SI engines.
 - g. Explain Physical delay and Chemical delay in CI Engines.
 - h. What do you mean by Scavenging in 2-Stroke engines?
 - i. What is soot?
 - j. Why additives are used in fuel?

SECTION B

- 2. Attempt any three of the following: 10 x 3 = 30**
- a. Compare Otto, Diesel and Dual Cycle on the following basis-
 - (i) Same Compression ratio and heat addition
 - (ii) Same Compression ratio and heat rejection
 - (iii) Same Peak pressure, peak temperature, and heat rejection
 - (iv) Same maximum pressure and heat addition
 - b. Discuss Flue Gas analysis & also describe theoretical air required for complete combustion.
 - c. What do you understand by turbo-charging? Also explain the effect of turbo-charging on CI engine.
 - d. Explain the working principle of nozzles. Also discuss the different types of nozzle with the help of neat and clean diagrams.
 - e. List down 4 properties that are important in the selection of fuels for an Engine. Explain the reasons for looking for alternate fuels for IC engines.

SECTION C

- 3. Attempt any one part of the following: 10 x 1 = 10**
- (a) What will be the effect on the efficiency of an Otto cycle having a compression ratio of 8, if C_v increases by 1.6 %?
 - (b) An engine works on air standard Diesel cycle whose compression ratio is 14. The pressure and temperature at the beginning of the cycle are 1 bar and 300 K respectively. The maximum temperature of the cycle is limited to 2500°C. Determine the thermal efficiency and mean effective pressure of the cycle.



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4. Attempt any *one* part of the following: 10 x 1 = 10
- (a) Write short notes on:
(i) Theoretical Flame Temperature
(ii) Adiabatic Flame Temperature
(iii) Actual Flame Temperature
- (b) The Percentage composition by mass of a sample of coal as found by analysis is given as :
C=90, H₂=3.3, O₂=3.0, N₂=0.8, S=0.9 & Ash=2.0
Calculate the minimum mass of air required for the complete combustion of 1 kg of this fuel. If 50% excess air is supplied, Find the total mass of dry flue gases/Kg of fuel & the % composition of DFG by volume.
5. Attempt any *one* part of the following: 10 x 1 = 10
- (a) Explain the stages of combustion in CI engine. Write a short note on fuel rating of CI engine.
- (b) Compare Battery and Magneto Ignition system. Describe with neat Sketch Battery Ignition system.
6. Attempt any *one* part of the following: 10 x 1 = 10
- (a) Derive an expression for the calculation of exact A-F ratio when compressibility of air is considered.
- (b) The diameter of the main jet of a simple carburetor is 0.2 cm and the pressure drop across the venturi is equivalent to 12 cm of water and the coefficient of discharge is 0.68. Density of petrol is 760 kg/m³. Find the mass flow rate of fuel into the carburetor.
7. Attempt any *one* part of the following: 10 x 1 = 10
- (a) What do you understand by dopes? Classify some of the additives used for S.I. and C.I. Engines. Also give merit and demerits of additives.
- (b) An engine works on Dual cycle having compression ratio of 10. The pressure and temperature at the beginning of compression stroke are 1 bar and 27° C respectively. If the maximum pressure reached is 42 bar and the maximum temperature of the cycle is 1500°C, calculate:
(i) The temperature at the end of constant volume heat addition
(ii) Cut-off ratio.
(iii) Work output.
(iv) Efficiency of the cycle.
Take C_v = 0.717 kJ/ kg K and C_p = 1.004 kJ/ kg K for air.