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Paper Id: 1 4 0 6 1 1

67

Roll No.

Sub Code: NME-014

9 5 0 8 2 4 0 0 5 5

(SEM VI) THEORY EXAMINATION 2017-18
MECHATRONICS

Time: 3 Hours

- Note: 1. Attempt all Sections.
2. If require any missing data, then choose suitably

Total Marks: 100

SECTION A

1. Attempt all questions in brief.

2 x 10 = 20

- Write down the advantages of mechatronics.
- Differentiate between conventional and mechatronics system design.
- Write down the names of control components in hydraulic actuator system.
- What is counter?
- What is A.C. Servomotor?
- Define Actuator.
- Give any two examples of mechatronics systems currently used now a day.
- Define adaptive control
- Explain block diagram of CNC machine
- Explain building blocks of chasis of car as a result wheel moving along road

SECTION B

2. Attempt any three of the following:

10 x 3 = 30

- Explain:
 - Analog to digital converter
 - Digital to analog converter
- Define sensor. Also explain the push pull sensors and capacitive proximity sensor
- What is stepper motor or stepper servomotor? Write the advantages and disadvantages of stepper servomotor.
- Describe the stages of mechatronics design process
- Explain:
 - Flexible manufacturing system
 - Challenges in mechatronics production unit

SECTION C

3. Attempt any one part of the following:

10 x 1 = 10

- Write down the few examples of mechatronics systems in industry
- Explain the term inversion of mechanism and different types of mechanisms used in mechatronics.

4. Attempt any one part of the following:

10 x 1 = 10

- What are logic gates? Draw and explain the various logic gates used in digital electronics.
- Explain programmable logic controller along with the ladder diagram.

10 x 1 = 10

5. Attempt any one part of the following:

- (a) Explain:
 - I. Hydraulic actuator
 - II. Pneumatic actuators
- (b) Consider a circuit which has a resistance R in series with capacitance C. the input to the circuit is V and output is potential difference across the capacitor V_c . The differential equation relating the input and output is:

$$V_c = RC \frac{dv_c}{dt} + V_c$$

- (a) Determine transfer function
- (b) Perform frequency response analysis

6. Attempt any one part of the following:

10 x 1 = 10

- (a) Discuss in detail the design of pick and place robot in perspective of mechatronics system design.
- (b) Explain the automatic car parking system in the context of mechatronics

7. Attempt any one part of the following:

10 x 1 = 10

- (a) Explain
 - I. Autotronics
 - II. Bionics
 - III. Avionics
- (b) Explain:
 - I. Computer integrated manufacturing
 - II. JIT production systems

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B TECH
(SEM VI) THEORY EXAMINATION 2017-18
MACHINE DESIGN-II

Time: 3 Hours**Total Marks: 100**

- Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.
2. Standard design data book is allowed.

SECTION A

1. **Attempt all questions in brief.** **2 x 10 = 20**
- Explain the phenomenon of interference in involute gears.
 - What condition must be satisfied in order that a pair of spur gears may have a constant velocity ratio?
 - What is Tredgold's approximation about the formative number of teeth on bevel gear?
 - Sketch neatly the working drawing of bevel gears in mesh.
 - What is a herringbone gear? Where they are used?
 - Explain the terms used in helical gears (a) Helix angle; (b) normal pitch.
 - Write the equation for the efficiency of the worm gear with nomenclature. Write down the condition for maximum efficiency.
 - What is meant by hydrodynamic lubrication in bearings?
 - Explain the terms as applied to journal bearings (a) Bearing characteristic number and (b) Bearing modulus.
 - At what angle of the crank, the twisting moment is maximum in the crankshaft? Explain.

SECTION B

2. **Attempt any three of the following:** **10 x 3 = 30**
- What are the various terms used in Hydrodynamic Journal Bearing? Explain each term with neat sketch.
 - The load on the journal bearing is 150 KN due to turbine shaft of 300 mm diameter running at 1800 rpm. Determine the length of the bearing if the allowable bearing pressure is 1.6 N/mm^2 , and amount of heat to be removed by the lubricant per minute if the bearing temperature is 60°C and viscosity of the oil at 60°C is 0.02 kg/m-s and the bearing clearance is 0.25 mm .
 - The ball bearings are to be selected for an application in which the radial load is 2500 N during 90 % of the time and 7000 N during the remaining 10 %. The shaft is to rotate at 150 rpm. Determine the minimum value of the basic dynamic load rating for 5000 hours of operation with not more than 10 % failures.
 - A pair of helical gears with 35° helix angle is used to transmit 17 kW at 12000 rpm of the pinion. The velocity ratio is 5:1. Both the gears are to be made of hardened steel of static strength 120 N/mm^2 . The gears are 20° stub and the pinion is to have 24 teeth. The face width may be taken as 12 times the module. Find the module and face width from the standpoint of strength and check the gears for wear.
 - Write down the step by step procedure to design a crankshaft. Also explain each parameter with nomenclature and relevant mathematical relations.

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SECTION C

10 x 1 = 10

3. Attempt any *one* part of the following:

- a) A bronze spur pinion rotating at 800 rpm drives a cast iron spur gear at a transmission ratio of 4:1. The allowable static stresses for the bronze pinion and cast iron gear are 90 MPa and 110 MPa respectively. The pinion has 16 standard 20° full depth involute teeth of module 8 mm. The face width of both the gears is 85 mm. Find the power that can be transmitted from the standpoint of strength.
- b) A pair of bevel gears is required to transmit 11 kW at 500 rpm from the motor shaft to another shaft, the speed reduction being 3:1. The shafts are inclined at 60°. The pinion is to have 24 teeth with a pressure angle of 20° and is to be made of cast steel having a static stress of 80 MPa. The gear is to be made of cast iron with a static stress of 55 MPa. The tooth form factor may be taken as $y = 0.154 - 0.912/T_E$, where T_E is formative number of teeth. The velocity factor may be taken as $3/(3 + v)$, where v is the pitch line velocity in m/s. The face width may be taken as 1/4th of the slant height of the pitch cone. The mid-plane of the gear is 100 mm from the left hand bearing and 125 mm from the right hand bearing. The gear shaft is to be made of cold-rolled steel for which the allowable tensile stress may be taken as 80 MPa. Design the gears and the gear shaft.

4. Attempt any *one* part of the following:

10 x 1 = 10

- a) A worm drive transmits 20 kW at 2500 rpm to a machine carriage at 70 rpm. The worm is triple threaded and has 60 mm pitch diameter. The worm gear has 85 teeth of 6 mm module. The tooth form is to be 20° full depth involute. The coefficient of friction between the mating teeth may be taken as 0.10. Calculate the tangential force acting on the worm and axial thrust and separating force on worm. Also calculate the efficiency of the worm drive.
- b) A four-stroke diesel engine has the following specifications: Brake power 7kW; Speed 1500rpm; Indicated mean effective pressure 0.35N/mm²; Mechanical efficiency 80%. Determine: 1. Bore and length of the cylinder; 2. Thickness of the cylinder head; and 3. Size of studs for the cylinder head.

5. Attempt any *one* part of the following:

10 x 1 = 10

- a) What are the materials used for Sliding Contact Bearings. A journal bearing 60 mm diameter and 90 mm long runs at 450 rpm. The oil used for hydrodynamic lubrication has absolute viscosity of 0.06 kg/m-s. If the diametric clearance is 0.1 mm, find the safe load on the bearing.
- b) A single stage helical gear reducer is to receive power from a 1440 rpm, 25 kW induction motor. The gear tooth profile is involute full depth with 20° normal pressure angle. The helix angle is 23°, number of teeth on pinion is 20 and the gear ratio is 3. Both the gears are made of steel with allowable beam stress of 90 MPa and hardness 250 BHN. (a) Design the gears for 20% overload carrying capacity from standpoint of bending strength and wear. (b) If the incremental dynamic load of 8 KN is estimated in tangential plane, what will be the safe power transmitted by the pair at the same speed?

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120617

Roll No:

1508220024

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B TECH
(SEM VI) THEORY EXAMINATION 2017-18
POWER THEFT AND ENERGY MANAGEMENT

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. What are the sources of energy?
- b. Explain Menace of power theft.
- c. Explain general principle of power measurement.
- d. Explain global energy crisis.
- e. What do you mean by limit switch?
- f. Explain why electricity is the most convenient form of energy.
- g. Explain energy audit.
- h. Explain DSM planning.
- i. Explain customer acceptance.
- j. What is the future of Indian power sector?

SECTION B

2. Attempt any three of the following:

10 x 3 = 30

- a) Explain the problem of Power Theft in detail. Why people pilfer energy?
- b) Explain how power theft is done in Electromechanical meters by bypassing meter and by insertion of film into meter
- c) Explain general principle of energy measurement and write a detailed note on its planning.
- d) Explain the nation and international Experiences with the DSM.
- e) Explain demand site management strategy its planning and implementation

SECTION C

3. Attempt any one part of the following:

10 x 1 = 10

- (a) What do you mean by security seal and tempering in energy meters? How it can helps to prevent power theft?
- (b) What do you mean by electricity loss and harmonics? Explain its national and global scenario.

4. Attempt any one part of the following:

10 x 1 = 10

- (a) Explain partial earth fault tempering and missing neural method for power theft in the voltage circuit of electromechanical meter.
- (b) Explain power theft in electronic meter by electrostatic discharge meter.

5. Attempt any one part of the following:

10 x 1 = 10

- (a) Explain the energy system and efficiency and the aspects of energy conservation.
- (b) Explain how the analysis and results of data are prepared for energy audit

6. Attempt any one part of the following:

10 x 1 = 10

- (a) What do you mean by DSM strategy? Also Explain in detail the scope of demand site management
- (b) What is the general principle of lightning system and equipment's used for the lightning?

7. Attempt any one part of the following:

10 x 1 = 10

- (a) Explain the concept of DSM and its evolution.
- (b) Explain power theft in electronic meter by printed circuit board and frequency circuit tampering.

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Paper Id: 1 2 0 6 0 4

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Roll No. 1 5 0 0 7 1 0 0 2 9

B.TECH.
(SEM IV) THEORY EXAMINATION 2017-18
SWITCHGEAR AND PROTECTION

Time: 3 Hours

Total Marks: 100

Note: 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 what you understand by pick-up value of actuating quantity.
 - b. Discuss what you understand by stability of a protective relay.
 - c. Explain time setting of over-current relay.
 - d. Compare the time-current characteristics of very inverse relay with that of IDMT relay.
 - e. Explain briefly reactance relay characteristic on the R-X diagram.
 - f. What do you understand by the term 'under-reach'?
 - g. What type of protective device is used for the protection of an alternator against overheating of its rotor?
 - h. What is magnetizing inrush current?
 - i. Discuss the energy balance theory of arc interruption in circuit breaker.
 - j. Define breaking capacity of a circuit breaker.

SECTION B

2. Attempt any three of the following: 10 x 3 = 30
- a. Discuss the working principle, types and applications of thermal relays.
 - b. Explain stepped time-distance characteristics of three impedance relaying units used for I, II and III zone of protection.
 - c. What is carrier current protection? What are its merits and demerits?
 - d. Discuss the protection employed for the field winding of the alternator against ground faults.
 - e. Discuss the operating principle of vacuum circuit breaker. What are its advantages over other circuit breakers?

SECTION C

3. Attempt any one part of the following: 10 x 1 = 10
- a. What are the various types of over-current relays? Discuss their area of applications.
 - b. Explain what you understand by primary and back-up protection. What are the various methods of providing back-up protection?
4. Attempt any one part of the following: 10 x 1 = 10
- a. What are the different types of attracted armature type relays? Explain why they are noisy.
 - b. What are the different types of amplitude comparators? Discuss the operating principle of rectifier bridge amplitude comparator.
5. Attempt any one part of the following: 10 x 1 = 10
- a. Draw and explain the characteristic of MHO relay on R-X diagram. Discuss the effect of power surge on its performance.

b. What is unit protection? Discuss the phase comparison scheme of carrier current protection.

6. Attempt any *one* part of the following: 10 x 1 = 10

a. What are the different methods of testing of circuit breakers? Discuss their merits and demerits.

b. Explain the terms: re-striking voltage, recovery voltage and RRRV. Derive expression for re-striking voltage and RRRV in terms of system voltage, inductance and capacitance.

7. Attempt any *one* part of the following: 10 x 1 = 10

a. Discuss the protection employed against loss of excitation of the alternator.

b. With a neat sketch, discuss the differential scheme for bus-zone protection.

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B.TECH
(SEM VI) THEORY EXAMINATION 2017-18
HIGH VOLTAGE ENGINEERING

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) What do you mean by ionization process of gases?
 - b) Explain thermal mechanism of breakdown in liquid dielectric.
 - c) What are the properties of composite dielectric?
 - d) Explain ripple voltage with full wave rectifier.
 - e) Explain a simple voltage doubler circuit.
 - f) Why are capacitance voltage dividers preferred for high ac voltage measurements?
 - g) Describe generating voltmeter used for the measurement of high voltage.
 - h) What is Hall generator.
 - i) Explain dc amplifier circuit for resistivity measurement.
 - j) What do you mean by Disruptive discharge voltage?

SECTION B

2. Attempt any three of the following: 10 x 3 = 30
- a) Explain the phenomenon of treeing and tracking in solid insulating materials under electrical stress. How does it lead to the breakdown?
 - b) Explain various theories that explain breakdown in commercial liquid dielectrics.
 - c) What is the basic principle of electrostatic machine? Explain Electrostatic generator.
 - d) Explain how a sphere gap can be used to measure the peak value of voltage. What are the parameters and factors that influence such voltage measurement?
 - e) Explain different high voltage test performs on HVDC power apparatus.

SECTION C

3. Attempt any one part of the following: 10 x 1 = 10
- (a) Explain Paschen's law. How do you account for the minimum voltage for the breakdown under a given 'p x d' condition?
 - (b) Explain Streamer theory that explain breakdown in gases.
4. Attempt any one part of the following: 10 x 1 = 10
- (a) Explain the generation of high frequency ac voltages and derive the relation for output voltage in terms of efficiency.
 - (b) An impulse generator has eight stages with each condenser rated for 0.2 μf and 100 kV. The load capacitor available is 1 nf. Calculate series resistance and the damping resistance needed to produce 1.2/50μs impulse wave. What is the maximum output voltage of the generator, if the charging voltage is 115 volt.
5. Attempt any one part of the following: 10 x 1 = 10
- (a) Explain the construction and working of an electrostatic voltmeter for very high voltage also gives its merits and demerits.
 - (b) Give the systematic arrangement of an impulse potential divider with an oscilloscope connected for measuring impulse voltage. Explain the arrangement used to minimize error.

6. Attempt any one part of the following:

10 x 1 = 10

- (a) Explain partial discharge tests on high voltage cables. How is a fault in the insulation located in this test.
- (b) Explain the method of impulse testing of high voltage transformers. What is the procedure adopted for locating the failure

7. Attempt any one part of the following:

10 x 1 = 10

- (a) What are the different types of resistive shunts used for impulse current measurement? Discuss their merits and demerits
- (b) Describe Mole's arrangement for measuring high dissipation factors in the low frequency range

Printed pages: 02

Paper Id:

120605

Roll No:

Sub Code: NEE 603

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B TECH
(SEM VI) THEORY EXAMINATION, 2017-18
SPECIAL ELECTRICAL MACHINE

Time: 3 Hours

Max Marks: 100

Note: Attempt all the sections. Assume missing data suitably, if any.

SECTION - A

- 1) Attempt **all** parts of the following: (10×2= 20)
- (a) What are the uses of PMAC motor?
 - (b) During plugging operation of a wound rotor induction motor, usually an external resistance is inserted into the rotor circuit, why?
 - (c) What are the applications of PCB motor?
 - (d) Write the four differences between stepper and conventional motor.
 - (e) A hybrid VRSM has 8 main poles which have 5 teeth each. Calculate the stepping angle, if the rotor has 50 teeth.
 - (f) How does switched reluctance motor differ from synchronous reluctance motor?
 - (g) Draw the torque speed characteristics of two phase AC servomotor.
 - (h) Why centrifugal switches are provided in most Single phase induction machine?
 - (i) What are the advantages of Constant power and constant torque controls in slip ring induction motor?
 - (j) Compare Permanent magnet brushless DC motor with Permanent magnet synchronous motor.

SECTION - B

- 2) Attempt any **three** questions of this section. (3×10= 30)
- a) Explain the construction, principle of operation, characteristics of universal and repulsion motors in detail with circuit diagram.
 - b) Describe the operation of brushless dc motor drive and explain its advantages.
 - c) Explain the torque versus stepping rate characteristics of a stepper motor. What is the slew range?
 - d) Elaborate the construction and torque speed characteristics of two phase AC servomotors.
 - e) Discuss about the principle of operation of a universal motor.

SECTION-C

- 3) Attempt any **one** of the following. (1×10=10)
- (a) Explain why a 1-phase induction motor as compared to 3-Phase induction motor has larger slip, less efficiency and more noise.
 - (b) Describe the theory that reveals that a single phase induction motor is inherently non-self starting, but once started, run like a three phase induction motor.

4) Attempt any **one** of the following:

(1X10=10)

- a) Derive the EMF and torque equation of permanent magnet synchronous motors.
- b) Explain the principle of operation of linear induction motor and show how does it differ from AC series motor?

5) Attempt any **one** of the following:

(1X10=10)

- a) Explain the operation of the different types of stepper motor. Compare them with applications.
- b) Discuss the following in brief about operations in Switched reluctance motor:
(i) Method of rotor position sensing (ii) Sensor less operations

6) Attempt any **one** of the following:

(1X10=10)

- a) What are the important features of a hysteresis synchronous motor? What are its applications?
- b) Describe the construction of double cage three phase induction motor. How does it differ from the slip ring and deep bar induction motors?

7) Attempt any **one** of the following:

(1X10=10)

- a) Explain the construction and principle of operation of shaded pole induction motor along with torque-slip characteristics and the applications.
- b) Describe how can speed of a slip ring induction motor be controlled by injecting EMF in rotor circuit?