R-17

Code: 7G564

III B.Tech. II Semester Supplementary Examinations December 2022
Instrumentation and Control Systems
(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours
Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)
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UNIT–I

1. Draw the schematic construction of LVDT and explain its working principle. What are its advantages and limitations? 14M

OR

2. Discuss about the Static characteristics of measuring instruments. 14M

UNIT–II

3. Explain the working principle of Hot wire anemometer. 14M

OR

4. Describe the principle of operation of a McLeod gauge with a neat sketch and mention its applications, merits and demerits. 14M

UNIT–III

5. How can seismic instruments can be used as an accelerometer? 14M

OR

6. Describe the working principle of Piezoelectric accelerometer with a neat sketch. 14M

UNIT–IV

7. Discuss briefly about strain measuring techniques 14M

OR

8. Distinguish between bonded and unbounded type of resistance strain gauge. 14M

UNIT–V

9. Explain in brief about Routh-Hurwitz stability criterion. 14M

OR

10. a) With the help of block diagram explain how is the water level in a boiler controlled? 7M

 b) Explain the Concept of stability and necessary conditions for stability. 7M

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III B.Tech. II Semester Supplementary Examinations December 2022
Managerial Economics and Financial Analysis
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours
Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)
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			Marks	CO	BL

UNIT–I

1.	What do you understand by elasticity of demand? How do you measure its? What is its significance?	14M	2	2

OR

2.	Define managerial economics? Explain nature and scope of managerial economics.	14M	1	2

UNIT–II

3.	How cost out-put relationship helps the entrepreneurs in expansion decisions.	14M	3	2

OR

4. a)	Objectives of break-even analysis.	7M	2	2
b)	Write about marginal rate of technical substitutions.	7M	2	2

UNIT–III

5.	Write about public sector enterprises in detail.	14M	3	2

OR

6.	Explain monopolistic market and price out-put determination in short run and long run.	14M	3	3

UNIT–IV

7.	What are the main sources of raising capital in detail?	14M	3	2

OR

8.	Narrate the capital budgeting and elaborate nature and significance, budgeting decisions.	14M	2	2

UNIT–V

9.	Prepare journal entries from the following Jan 1 started business with cash Rs 50000 Jan 3 deposit into bank Rs 65000 Jan 10 purchased machinery Rs54000 from Manohar. Jan 16 sold goods for cash Rs 72000 Jan 20 received cash from business Rs 62000 Jan 21 paid salary Rs 2000 Jan 23 discount received Rs 400 Jan 24 Return goods from siva Rs 1000 Jan 27 with drawn from the bank Rs 2000	14M	3	3

OR

10.	Describe double entry system and trail balance advantages.	14M	2	2

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III B.Tech. II Semester Supplementary Examinations December 2022
Design of Machine Elements-II
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours
Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)
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UNIT–I

1. a) Enumerate the important physical characteristics of a good bearing material. 6M

   b) Describe the design procedure for a journal bearing. 8M

OR

2. Design a journal bearing for a centrifugal pump from the following data: Load on the journal=20000N, Speed of the journal=900rpm, Type of oil is SAE 10, for which the absolute viscosity at 55°C=0.017kg/m-s, Ambient temperature of oil = 15.5^0C, Maximum bearing pressure for the pump=1.5N/mm^2.Calculate also mass of the lubricating oil required for artificial cooling, if the rise of temperature of oil be limited to l0°C heat dissipation coefficient=1232W/m^2/°C. 14M

UNIT–II

3. a) What are the advantages of Rolling contact bearings over sliding contact bearings? 6M

   b) Explain the procedure used for designing of a rolling contact bearing. 8M

OR

4. a) Explain dynamic Load Rating for Rolling Contact Bearings under Variable Loads 6M

   b) A single-row deep groove ball bearing (6315) is subjected to a radial force of 8 kN and a thrust force of 3 kN. The values of X and Y factors are 0.56 and 1.5 respectively. The shaft rotates at 1200 rpm. (i) Estimate the life of this bearing, with 90% reliability.
   (ii) Estimate the reliability for 20 000 h life. 8M

UNIT–III

5. Describe the design procedure for the trunk type piston of an I.C.Engine. 14M

OR

6. Design a cast iron piston for a single acting four stroke engine for the following data:
   Cylinder bore=100mm, stroke=125 mm, maximum gas pressure=5 N/mm^2, induced mean effective pressure=0.75 N/mm^2, mechanical efficiency=80%, fuel consumption=0.15 kg per BP per hour, higher calorific value = 42000 kJ/kg, speed=2000 rpm, assume suitable data if required and state the assumptions made. 14M

UNIT–IV

7. Design and draw a valve spring of a petrol engine for the following operating conditions:
   Spring load when the valve is open   = 400 N
   Spring load when the valve is closed = 250 N
   Maximum inside diameter of spring = 25 mm
   Length of the spring when the valve is open= 40 mm
   Length of the spring when the valve is closed = 50 mm
   Maximum permissible shear stress = 400 MPa 14M

OR

8. A leather belt 9 mm × 250 mm is used to drive a cast iron pulley 900 mm in diameter at 336 r.p.m. If the active arc on the smaller pulley is 120° and the stress in tight side is 2MPa, find the power capacity of the belt. The density of leather may be taken as 980kg/m^3, and the coefficient of friction of leather on cast iron is 0.35. 14M

UNIT–V

9. a) What are the advantages of Spur gears? 4M

b) The pitch circle diameters of the pinion and gear are 100 mm and 300 mm respectively. The pinion is made of plain carbon steel 40C8 (S_{ut}=600 MPa) while the gear is made of grey Cast Iron FG 300 (S_{ut}=300 MPa). The pinion receives 5 kW power at 500 rpm through its shaft. The service factor and the factor of safety can be taken as 1.5 each. The face width of the gear can be taken as 10 times that of the module. Assume that the velocity factor accounts for the dynamic load. Determine (i) module and (ii) the number of teeth on the pinion and the gear. 10M

OR

10. a) Derive the Lewis equation for the beam strength of a gear tooth. 4M

b) Design a pair of helical gears to transmit power of 15 kW at 3200 rpm with speed reduction 4:1, pinion is made of cast steel 0.4% C–untreated. Gear made of high grade C.I. Helix angle is limited to 26^0 and not less than 20 teeth are to be used on eighter gear. 10M

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Code: 7G563

III B.Tech. II Semester Supplementary Examinations December 2022

Heat Transfer

(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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UNIT–I

1. Derive three dimensional general heat conduction equation in Cartesian coordinates. — 14M

OR

2. The wall of an industrial furnace is constructed from 0.15m thick fireclay brick having steady state operation reveal temperature of 1400 k and 1150 k at the inner and outer surfaces respectively. What is the rate of heat loss through a wall that is 0.5m by 1.2m on a side? — 14M

UNIT–II

3. Derive the equation for a heat transfer at critical value thickness for a cylinder pipe? — 14M

OR

4. A long rod 5 cm diameter its base is connected to a furnace wall at 150⁰C, while the end is projecting into the room at 20⁰C. The temperature of the rod at distance of 20 cm a part from its base is 600C. The conductivity of the material is 200W/mk. Determine convective heat transfer coefficient. — 14M

UNIT–III

5. a) What is the hydraulic diameter? When is it used? — 5M

   b) Define Reynolds number, Prandtl number and Nusselt number — 9M

OR

6. Water at 60 oC enters a tube of 2.54-cm diameter at a mean flow velocity of 2 cm/s. Calculate the exit water temperature if the tube is 3.0 m long and the wall temperature is constant at 80oC. — 14M

UNIT–IV

7. Explain pool boiling with neat sketch showing different regimes. — 14M

OR

8. A truncated cone has top and bottom diameters of 10 cm and 20 cm and a height of 10 cm. Calculate the shape factor between the top surface and the side and also the shape factor between the side and itself. — 14M

UNIT–V

9. Derive an expression for the LMTD method of Parallel flow heat exchangers? — 14M

OR

10. a) What are fouling factors? Explain their effects in the heat exchangers design. — 6M

    b) Determine the overall heat transfer coefficient based on outer area of a 3.81cm O.D and 3.175 cm I.D brass tube(k = 103.8 W/m K) if the heat transfer coefficients for flow inside and outside the tubes are 2270 and 2840 W/m2 K respectively, and the unit fouling resistances at inside and outside are Rfi = Rfo = 8.8 x 10-3 m2 K/W — 8M

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