

Code: 19A353T

III B.Tech. I Semester Supplementary Examinations June 2024

Design of Machine Elements-I
(Mechanical Engineering)

Max. Marks: 70

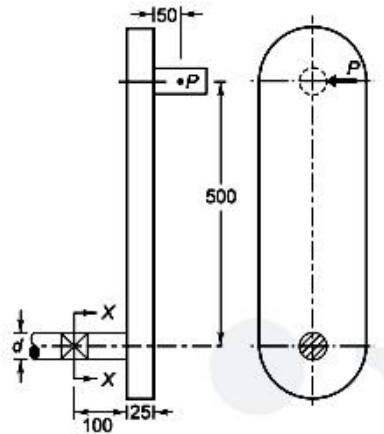
Time: 3 Hours

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

Marks

UNIT-I

1. The dimensions of an overhang crank are given in Fig. The force P acting at the crankpin is 1 kN. The crank is made of steel 30C8 ($S_{yt} = 400 \text{ N/mm}^2$) and the factor of safety is 2. Using maximum shear stress theory of failure, determine the diameter d at the section - XX.



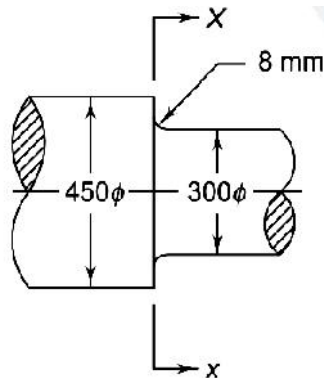
14M

OR

2. a) Classify the different types of loads and explain corresponding stresses induced in machine members in brief. 7M
 b) What are the manufacturing considerations to be considered by design? 7M

UNIT-II

3. The section of a steel shaft is shown in Fig. The shaft is machined by a turning process. The section at XX is subjected to a constant bending moment of 500 kN-m. The shaft material has ultimate tensile strength of 500 MN/m², yield point of 350 MN/m² and endurance limit in bending for a 7.5 mm diameter specimen of 210 MN/m². The notch sensitivity factor can be taken as 0.8. The theoretical stress concentration factor can be taken as 2.5633, notch sensitivity as 0.9, the reliability as 90%. Take $K_{sur}=0.8$. Find the diameter of shaft.



14M

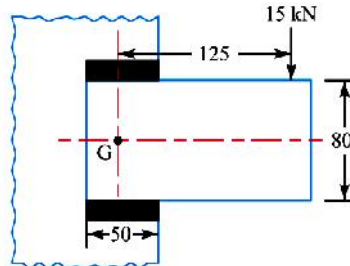
OR

Important Note: 1. On completing your answers. Compulsorily draw diagonal cross line on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and/or equations written eg. 32+8=40, will be treated as malpractice.

4. a) Determine the size of a piston rod subjected to a total load having cyclic fluctuation from 150 kN (tension) to 25 kN (compression). The endurance limit is 360 MPa and yield strength is 400 MPa. Take factor of safety = 1.5; surface finish factor = 0.88 and stress concentration factor = 2.25. 7M
- b) Describe Goodman's criteria. 7M

UNIT-III

5. A bracket carrying a load of 15 kN is to be welded as shown in Fig. Find the size of weld required if the allowable shear stress is not to exceed 80 MPa.



14M

OR

6. a) An electric motor weighing 10 kN is lifted by means of an eye bolt. The eye bolt is screwed into the frame of the motor. The eye bolt has coarse threads. It is made of plain carbon steel 30C8 ($S_{yt} = 400 \text{ N/mm}^2$) and the factor of safety is 6. Determine the size of the bolt. 7M
- b) What are the advantages and disadvantages of welded joints over threaded joints? 7M

UNIT-IV

7. Design and draw a cotter joint to support a load varying from 30 kN in compression to 30 kN in tension. The material used is carbon steel for which the following allowable stresses may be used. The load is applied statically. Tensile stress = compressive stress = 50 MPa ; shear stress = 35 MPa and crushing stress = 90 MPa. 14M

OR

8. a) Sketch and explain the design procedure for a Cotter joint with Gib. 9M
- b) What are the applications of knuckle joint? 5M

UNIT-V

9. A shaft is supported by two bearings placed 1 m apart. A 600 mm diameter pulley is mounted at a distance of 300 mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having maximum tension of 2.25 kN. Another pulley 400 mm diameter is placed 200 mm to the left of right hand bearing and is driven with the help of electric motor and belt, which is placed horizontally to the right. The angle of contact for both the pulleys is 180° and $\mu = 0.24$. Determine the suitable diameter for a solid shaft, allowing working stress of 63 MPa in tension and 42 MPa in shear for the material of shaft. Assume that the torque on one pulley is equal to that on the other pulley. 14M

OR

10. a) How the shaft is designed when it is subjected to twisting moment and bending moment? 7M
- b) Classify the shaft coupling. 7M

Hall Ticket Number :

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R-19

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Machine Tools

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

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

Marks CO BL

UNIT-I

1. Why relief angles, cutting edge angles and nose radius are be provided for a single point cutting tool. Explain with neat sketches. 14M CO2 L4

OR

2. a) Explain about ASA system in detail. 6M CO1 L1
b) List out the various types of cutting tool materials and its properties? 8M CO1 L1

UNIT-II

3. Classify the Multi Spindle Automatic Lathe machines. Explain any one type of Multi Spindle Automatic Lathe machine. 14M CO2 L4

OR

4. a) Write a short notes on single spindle Automatic Lathes. 7M CO2 L1
b) Describe any two work holding devices used in Lathe. With neat sketches? 7M CO2 L1

UNIT-III

5. a) Write short notes on Deep Hole Drilling machine. 7M CO3 L2
b) With the help of a sketch, explain the working of a Universal dividing head. 7M CO3 L1

OR

6. a) Distinguish between Shaper and Planer? 7M CO3 L2
b) Explain up Milling and down Milling with neat sketches 7M CO3 L2

UNIT-IV

7. How do you classify Grinding machines? Explain about Centre less Grinding machine with neat sketch. 14M CO4 L1

OR

8. a) Write short notes on Abrasive types & usage 7M CO4 L2
b) Compare Grinding, Lapping and Honing processes. 7M CO5 L5

UNIT-V

9. Explain about Box Jig with neat sketch 14M CO5 L2

OR

10. Explain the 3-2-1 Principle with neat sketch 14M CO5 L2

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R-19

Code: 19A35HT

III B.Tech. I Semester Supplementary Examinations June 2024

Automation & Robotics
(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

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

UNIT-I

- | | Marks | CO | BL |
|--|-------|-----|----|
| 1. Explain the strategies of an Automation. | 14M | CO1 | L2 |
| OR | | | |
| 2. Explain the hardware components for automation and process control. | 14M | CO1 | L2 |

UNIT-II

- | | | | |
|---|-----|-----|----|
| 3. What is an Automated assembly system? Classify and explain the types of automated assembly systems | 14M | CO2 | L2 |
| OR | | | |
| 4. With a suitable example, explain the procedure of Ranked Position Weights (RPW) method of Line Balancing | 14M | CO2 | L2 |

UNIT-III

- | | | | |
|--|-----|-----|----|
| 5. a) Explicate the concept of degrees of freedom | 7M | CO3 | L2 |
| b) Explain with neat sketch the application of robot in material handling. | 7M | CO3 | L2 |
| OR | | | |
| 6. Define a Robot. Briefly explain the components of robots with neat sketch | 14M | CO3 | L2 |

UNIT-IV

- | | | | |
|--|-----|-----|----|
| 7. What is Robot kinematics? Explain Robot Translation, Rotation and Transformation in Robot | 14M | CO4 | L2 |
| OR | | | |
| 8. Discuss about Skew motion joint integrated motion and straight line motion with examples. | 14M | CO4 | L2 |

UNIT-V

- | | | | |
|--|----|-----|----|
| 9. a) Explain the importance of actuators in robots | 7M | CO5 | L2 |
| b) With a schematic diagram, describe the principle of operation of ANY ONE external sensor. | 7M | CO5 | L5 |
| OR | | | |
| 10. a) Discuss about the working of Electric motors with a sketch | 7M | CO5 | L2 |
| b) State the importance of the sensors in robotics. | 7M | CO5 | L1 |

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R-19

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III B.Tech. I Semester Supplementary Examinations June 2024

Applied Thermodynamics-II

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

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

Marks CO BL

UNIT-I

1. In a single-heater regenerative cycle the steam enters the turbine at 40 bar, 400°C and the exhaust pressure is 0.1 bar. The feed water heater is a direct contact type which operates at 6 bar. Find: (i) the efficiency and the steam rate of the cycle, (ii) the increase in mean temperature of heat addition, efficiency and steam rate as compared to the Rankine cycle without regeneration. Pump work may be neglected. 14M CO1 L3

OR

2. Discuss Reheat Rankine cycle with a neat sketch. 14M CO1 L2

UNIT-II

3. In a boiler test 1100 kg of coal is consumed in 24hours. The mass of water evaporated is 10000 kg and the mean effective pressure is 7 bar. The feed water temperature was 40°C, heating value of coal is 30000 kJ/kg. The enthalpy of 1kg steam at 7 bar is 2570.7 kJ. Determine Equivalent evaporation per kg of coal and Efficiency of the boiler. 14M CO2 L3

OR

4. a) Describe any one type of pressure gauge used in boilers with diagram 7M CO2 L2
b) Classify steam generators in detail. 7M CO2 L4

UNIT-III

5. A convergent divergent nozzle is required to discharge 2 kg/sec of steam. The nozzle is supplied with steam at 7 bar and 200°C and discharge takes place against a back pressure of 1 bar. The expansion up to throat is isentropic and the frictional resistance between throat and exit is equivalent to 63 kJ/kg of steam. Taking approach velocity of 75 m/sec and throat pressure of 4 bar estimate suitable areas for the throat and exit. 14M CO3 L3

OR

6. a) Classify nozzles with suitable diagrams. 7M CO3 L4
b) Explain critical pressure ratio of a nozzle? 7M CO3 L2

UNIT-IV

7. A prime mover uses 15000 kg of steam per hour and develops 2450 kW. The steam is supplied at 30 bar and 350°C. The exhaust from the prime mover is condensed at 725 mm of Hg when barometer records 755 mm of Hg. The condensate temperature from the condenser is 30°C and the rise of temperature of circulating water is from 8°C to 18°C. Determine :(i) The quality of steam entering the condenser. (ii) The quantity of circulating cooling water and the ratio of cooling. 14M CO4 L3

OR

8. a) Differentiate jet condensers with surface condensers. 7M CO4 L4
b) Classify the steam condensers. 7M CO4 L4

UNIT-V

9. Derive the condition for maximum efficiency and blade height of reaction turbine. 14M CO5 L6

OR

10. a) Illustrate governing of turbines with a suitable diagram 7M CO5 L4
b) Explain velocity compounding in steam turbines with neat sketch 7M CO5 L2
