

Code: 19A353T

III B.Tech. I Semester Supplementary Examinations Nov/Dec 2023

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. A cylindrical shaft made of steel of yield strength 700 MPa is subjected to static loads consisting of bending moment 10 kN-m and a torsional moment 30 kN-m. Determine the diameter of the shaft using different theories of failure, and assuming a factor of safety of 2. Take $E = 210$ GPa and poisson's ratio = 0.25.

14M

OR

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

7M

7M

UNIT-II

3. A simply supported beam has a concentrated load at the centre which fluctuates from a value of P to $4P$. The span of the beam is 500 mm and its cross-section is circular with a diameter of 60 mm. Taking for the beam material an ultimate stress of 700 MPa, a yield stress of 500 MPa, endurance limit of 330 MPa for reversed bending, and a factor of safety of 1.3, calculate the maximum value of P . Take a size factor of 0.85 and a surface finish factor of 0.9

14M

OR

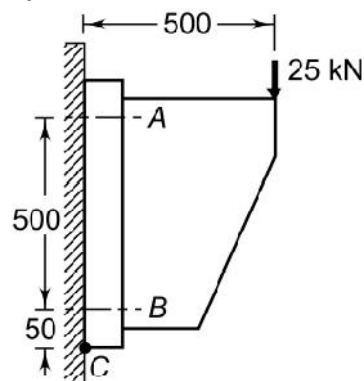
4. a) Define endurance limit? Discuss the factors which affect the endurance limit of the material.
- b) Explain the following terms: (i) Stress concentration (ii) Endurance limit

8M

6M

UNIT-III

5. A wall bracket is attached to the wall by means of four identical bolts, two at A and two at B, as shown in Fig. Assuming that the bracket is held against the wall and prevented from tipping about the point C by all four bolts and using an allowable tensile stress in the bolts as 35 N/mm², determine the size of the bolts on the basis of maximum principal stress theory.



14M

OR

6. a) List out the advantages and disadvantages of screw joints.
- b) What are the advantages and disadvantages of welded joints over threaded joints?

7M

7M

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.

UNIT-IV

7. Design a gib and cotter joint to join square rods, to carry a maximum load of 35 kN. Assuming that the gib, cotter and rod are of same material and have the following allowable stresses: $\tau = 20$ MPa ; $\sigma = 15$ MPa ; and $\sigma_c = 50$ MPa. 14M

OR

8. a) What are the applications of knuckle joint? 6M
 b) Explain different types of keys with sketches. 8M

UNIT-V

9. Design a bushed-pin type of flexible coupling to connect a pump shaft to a motor shaft transmitting 32 kW at 960 r.p.m. The overall torque is 25 percent more than mean torque. The material properties are as follows :

(a) The allowable shear and crushing stress for shaft and key material is 40 MPa and 80 MPa respectively.

(b) The allowable shear stress for cast iron is 15 MPa.

(c) The allowable bearing pressure for rubber bush is 0.8 N/mm².

(d) The material of the pin is same as that of shaft and key.

Draw neat sketch of the coupling. 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

Code: 19A35JT

III B.Tech. I Semester Supplementary Examinations Nov/Dec 2023

Industrial Robotics
(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. Define Robot? Explain robot components with a neat sketch. 14M CO1 L2

OR

2. Define gripper? Explain ANY THREE types of grippers with neat diagrams. 14M CO1 L2

UNIT-II

3. Define forward and reverse kinematics of robot and derive forward and inverse robot kinematic equations for a 2DOF system? 14M CO2 L2

OR

4. Derive an equation for representation of pure rotation about an axis. 14M CO2 L2

UNIT-III

5. Define trajectory planning? Write a short note on types of trajectory planning. 14M CO3 L2

OR

6. Write down steps involved in trajectory planning with an example 14M CO3 L2

UNIT-IV

7. Define sensor? Briefly explain the working principle of ANY TWO types of contact type sensors with a neat sketch. 14M CO4 L2

OR

8. a) Explain briefly about the following terms:
Electrical actuators 7M CO4 L2

b) Mechanical actuators 7M CO4 L2

UNIT-V

9. Explain modes of robot programming? 14M CO5 L2

OR

10. Explain briefly about the following terms:
(i) On-line Programming 7M CO5 L2

(ii) Off-line Programming 7M CO5 L2

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R-19

Code: 19A352T

III B.Tech. I Semester Supplementary Examinations Nov/Dec 2023

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)

UNIT-I

Marks CO BL

1. Draw the Merchant circle diagram and derive the expressions to show the relationship among the different forces acting on the cutting tool and different parameters involved in metal cutting? 14M CO2 L4

OR

2. a) Explain about ASA system in detail. 5M CO1 L1
b) List out the various types of cutting tool materials and its properties? 9M CO1 L1

UNIT-II

3. What is the basic difference between Tail stock and Turret in Lathe machine? Draw the hexagonal turret used in Lathe machine. 14M CO2 L2

OR

4. a) Describe any two work holding devices used in Lathe. With neat sketches? 7M CO2 L1
b) List out the various types of Dead centers in Lathe machine? Explain any two with neat sketches. 7M CO2 L1

UNIT-III

5. Discuss in detail the working of an open and cross belt type Planning machine. With neat sketch 14M CO3 L3

OR

6. a) Explain up Milling and down Milling with neat sketches 7M CO3 L2
b) Define Indexing. Explain the following Indexing methods.
(i) Direct Indexing (ii) Simple Indexing 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) Predict at least one Micro Finishing method and explain it in detail 7M CO5 L3
b) Explain about Buffing and Polishing operations? 7M CO5 L2

UNIT-V

9. List out the various types Drill Bushes explain any two with neat sketches? 14M CO5 L2

OR

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

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R-19

Code: 19A35IT

III B.Tech. I Semester Supplementary Examinations Nov/Dec 2023

Rapid Prototyping
(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. List and explain various Rapid Prototyping Data Formats? And also explain about the significance of STL format? 14M CO1 L2

OR

2. a) What is the need for additive manufacturing system, Explain? 7M CO1 L1
b) Define virtual prototyping and its applications 7M CO1 L1

UNIT-II

3. With a neat sketch, explain the construction and operation of SGC technique and also list advantages and disadvantages of it. 14M CO2 L2

OR

4. a) Explain the working principle of stereo lithography system with neat sketch 7M CO2 L2
b) How photo polymerizations works. Describe with a neat sketch. 7M CO2 L5

UNIT-III

5. Explain about the laser engineering net shaping (LENS) with their applications, advantages and limitations. 14M CO3 L2

OR

6. Explain the principle, process parameters and applications of 3D Printing. 14M CO3 L2

UNIT-IV

7. Analyze reverse engineering technique with respect to digitization and explain 14M CO4 L4

OR

8. a) Distinguish between active and passive techniques in reverse engineering. 7M CO4 L2
b) How the 3D-photogram used in reverse engineering process? Explain with suitable example. 7M CO4 L5

UNIT-V

9. Write few industrial applications of RP process 14M CO5 L1

OR

10. Elaborate Pre-processing errors in SLS process. 14M CO5 L4

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R-19

Code: 19A35HT

III B.Tech. I Semester Supplementary Examinations Nov/Dec 2023

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. What are the basic elements of an automation? Explain them. 14M CO1 L2

OR

2. a) Explain the following

(i) Starving of stations

(ii) Blocking of Stations

7M CO1 L2

b) Briefly explain the analysis of a flow line without buffer storage

7M CO1 L2

UNIT-II

3. a) What is Line Balancing.? Classify line balancing methods. 7M CO2 L1

b) Write short notes on Flexible manual assembly lines 7M CO2 L1

OR

4. Discuss the procedure of Largest candidate rule of Line balancing with relevant example 14M CO2 L2

UNIT-III

5. Explain the types of Robot coordinate systems(configurations) with neat sketches 14M CO3 L2

OR

6. a) Explain the functional line diagrams in Robot 7M CO3 L2

b) State the advantages and disadvantages of Robot 7M CO3 L2

UNIT-IV

7. Explain the Langrange-Euler formulation for a 2 degree of freedom robot. 14M CO4 L2

OR

8. a) What are homogeneous transformations in Robot kinematics? 7M CO4 L1

b) For a vector $20i + 25j + 10k$, perform a translation by a distance of 8 units in x direction, 7 units in y direction and 4 units in z direction. 7M CO4 L4

UNIT-V

9. a) Discuss the working principle of Pneumatic actuators 7M CO5 L2

b) With a sketch explain the working of proximity sensors. 7M CO5 L2

OR

10. a) Distinguish between tactile sensing and proximity sensing. 7M CO5 L4

b) Outline the need for position sensing and velocity sensing in robotics 7M CO5 L3

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R-19

Code: 19A351T

III B.Tech. I Semester Supplementary Examinations Nov/Dec 2023

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)

UNIT-I

Marks CO BL

1. a) A simple Rankine cycle works between pressure of 25bar and 0.04bar. The initial condition of steam being dry saturated. Calculate the cycle efficiency. 8M CO1 L3
 b) Define mean temperature of heat addition. 6M CO1 L1

OR

2. Explain with the help of neat diagram a Regenerative cycle. 14M CO1 L2

UNIT-II

3. a) A boiler uses 14 kg of air per kg of fuel. The temperature of the hot gasses inside the chimney is 597°C and the outside air is 17°C. If the draught produced is 26 mm of water. Determine the minimum height of the chimney required. 8M CO2 L4
 b) Sketch and explain dead weight safety valve. 6M CO2 L2

OR

4. a) Illustrate about fusible plug. 5M CO2 L3
 b) Discuss the merits and demerits of forced draught over natural draught. 9M CO2 L2

UNIT-III

5. Derive the expression for condition of maximum discharge through nozzle. 14M CO3 L6
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. The absolute pressure in the condenser is 11.56 kPa when the barometer reads 1 bar. The condenser temperature is 40°C. Calculate the partial pressure of air, vacuum efficiency and mass of air present in the condenser per kg of steam. 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. Define degree of reaction and show that for Parsons reaction turbine it is 50%. 14M CO5 L3

OR

10. a) Explain velocity compounding in steam turbines with neat sketch 8M CO5 L2
 b) Compare impulse turbine with reaction turbine. 6M CO5 L5
