Hall Ticket Number :										

R-19

Code: 19A353T

III B.Tech. I Semester Supplementary Examinations March/April 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)

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Marks

UNIT–I

1. a) Explain any two theories of failures. 6M

   b) Find the diameter of a round rod subjected to a combined bending moment of 2 kNm and a torque of 1.2 kNm? The allowable normal and shear stresses for the material are 120 MPa and 75 MPa respectively 8M

OR

2. A cylindrical shaft made of steel yield strength 800Mpa is subjected to static loads bending moment 20kN-m and twisting moment 30N-m. Calculate the diameter of the shaft using Normal stress theory and Von Mises theory. Assume factor of safety is 2. 14M

UNIT–II

3. a) Describe Goodman's criteria. 7M

   b) A Connecting rod of a steam engine is subjected to an axial load of 70kN which is completely reversed. Determine the required diameter of rod using a factor of safety 2.6. For material of the rod yield strength: 310MPa, ultimate strength: 580MPa, surface finish factor: 0.78, size factor: 0.81. 7M

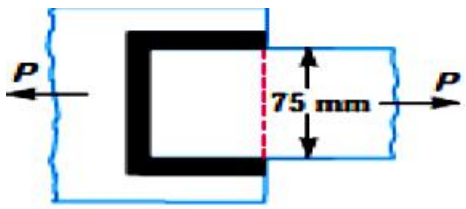
OR

4. a) Discuss the causes for stress concentration. 4M

   b) Determine the diameter of a circular rod made of ductile material with fatigue strength of 280 MPa and yield strength of 350 MPa. The member is subjected to a varying axial load from 700KN to-300KN. Assume K_t=1.8 and F.S = 2.0. 10M

UNIT–III

5. A plate 75 mm wide and 12.5 mm thick is joined with another plate by a single transverse weld and a double parallel fillet weld as shown in fig. The maximum tensile and shear stresses are 70 MPa and 56 MPa respectively. Find the length of each parallel fillet weld, if the joint is subjected to both static and fatigue loading.



14M

OR

6. a) Enumerate various stresses due to initial tightening of screwed fasteners. 7M

   b) The cylinder head of effective diameter 300mm for a steam engine is subjected to 1.2 MPa. It is held in position by means of 12 studs. A soft copper gasket is used to make joint leak proof. Determine the size of blots or studs, so that the stress should not exceed 100 MPa. 7M

UNIT–IV

7. Design a knuckle joint to transmit 150 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression. 14M

OR

8. A 15 kW, 960 r.p.m. motor has a mild steel shaft of 40 mm diameter and the extension being 75 mm. The permissible shear and crushing stresses for the mild steel key are 56 MPa and 112 MPa. Design the keyway in the motor shaft extension. Check the shear strength of the key against the normal strength of the shaft. 14M

UNIT–V

9. Design and draw a protective type of cast iron flange coupling for a steel shaft transmitting 15 kW at 200 r.p.m and having an allowable shear stress of 40 MPa. The working stress in the bolts should not exceed 30MPa. Assume the same material is used for the shaft and the key and that the crushing stress twice the value of its shear stress. The maximum torque is 25% greater than the full load torque. The shar stress for cast iron is 14MPa. 14M

OR

10. Design and draw a cast iron flange coupling for a mild steel shaft transmitting 90 kW at 250 r.p.m. The allowable shear stress in the shaft is 40 MPa and the angle of twist is not to exceed 1° in a length of 20 diameters. The allowable shear stress in the coupling bolts is 30MPa. 14M

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III B.Tech. I Semester Supplementary Examinations March/April 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)

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			Marks	CO	BL
		UNIT–I			
1.	a)	List out the various types of cutting tool materials and its properties?	7M	CO1	L1
	b)	Describe the factors which are influencing the tool life?	7M	CO1	L2
		OR			
2.		What is the use of cutting fluid in metal cutting? List out the various types of cutting fluids and its properties?	14M	CO1	L4
		UNIT–II			
3.	a)	Write the difference between Capstan Lathe and Turret Lathe	7M	CO2	L2
	b)	Write a short notes on single spindle Automatic Lathes.	7M	CO2	L1
		OR			
4.		List out the various types of Taper Turning methods. Explain any one with neat sketch.	14M	CO2	L1
		UNIT–III			
5.		List out the various types of Milling Operations. Explain any three Milling Operations with neat sketches.	14M	CO3	L1
		OR			
6.		Describe with a line diagram of Whitworth quick return mechanisms used in Shaper.	14M	CO3	L3
		UNIT–IV			
7.		Draw the Broach tool and indicate Broach elements on it?	14M	CO4	L2
		OR			
8.	a)	Compare Grinding, Lapping and Honing processes.	7M	CO5	L5
	b)	Write the difference between Grinding and Super finishing operations.	7M	CO4	L2
		UNIT–V			
9.		Explain the 3-2-1 Principle with neat sketch	14M	CO5	L2
		OR			
10.		List out any two types of Universal Fixtures with neat sketch	14M	CO5	L1

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Code: 19A351T

III B.Tech. I Semester Supplementary Examinations March/April 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)

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			Marks	CO	BL
		UNIT–I			
1.	a)	Explain generic RP process with neat sketch	7M	CO1	L2
	b)	Differentiate between Traditional Prototyping Vs. Rapid Prototyping	7M	CO1	L2
		OR			
2.		What is the need for time compression in product development? Explain it with a graphical representation.	14M	CO1	L4
		UNIT–II			
3.	a)	With a neat sketch explain the working of SLA technique	7M	CO2	L2
	b)	List the different materials which may be used in manufacturing of products in SLA techniques	7M	CO2	L3
		OR			
4.	a)	List the specifications of FDM machine	7M	CO2	L3
	b)	List the different materials which may be used in FDM machine	7M	CO2	L3
		UNIT–III			
5.		What are the factors that influence the performance of the 3D printing process? Explain in detail.	14M	CO3	L2
		OR			
6.		List out technical specifications of 3D printer	14M	CO3	L3
		UNIT–IV			
7.		Explain the concept rapid tooling with a case study	14M	CO4	L2
		OR			
8.	a)	Differentiate soft and hard tooling	7M	CO4	L2
	b)	Explain silicon rubber tooling	7M	CO4	L2
		UNIT–V			
9.		List out the different errors occurs in RP processes. Explain Pre-Processing and Post-Processing Errors in RP Process.	14M	CO5	L3
		OR			
10.		Where to used reverse engineering in medical applications, explain the suitable examples.	14M	CO5	L1

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R-19

Code: 19A351T

III B.Tech. I Semester Supplementary Examinations March/April 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)

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			Marks	CO	BL
		UNIT–I			
1.		Explain with the help of neat diagram a Regenerative cycle.	14M	CO1	L2
		OR			
2.		A steam power plant operates on a theoretical reheat cycle. Steam at boiler at 150 bar, 500ºC expands through the high pressure turbine. It is reheated at a constant pressure of 50 bar to 500ºC and expands through the low pressure turbine to a condenser at 0.1 bar. Draw T-s and h-s diagrams. Find: (i) Quality of steam at turbine exhaust.(ii) Cycle efficiency. (iii) Steam rate in kg/kWH.	14M	CO1	L3
		UNIT–II			
3.	a)	Classify steam generators in detail.	6M	CO2	L4
	b)	Explain the construction and working of simple vertical boiler.	8M	CO2	L2
		OR			
4.		A steam generator evaporates 18000 kg/hr of steam at 12.5 bar and a quality of 0.97 dry from feed water at 105ºC, when coal is fired at 2040 kg/hr. if the higher calorific value of coal is 27400 kJ/kg, find the (a) heat rate of boiler in kJ/hr, (b) equivalent evaporation and (c) thermal efficiency.	14M	CO2	L3
		UNIT–III			
5.	a)	Define nozzle efficiency? Explain the effect of friction on flow through steam nozzles with the help of h-s diagram.	7M	CO3	L1
	b)	Classify nozzles with suitable diagrams.	7M	CO3	L4
		OR			
6.		Calculate the throat and exit diameters of a convergent- divergent nozzle, which will discharge 820 kg of steam per hour at a pressure of 8 bar Superheated to 220^{0}C into a chamber having a pressure of 1.5 bar. The friction loss in the divergent portion of the nozzle may be taken as 0.15 of the isentropic enthalpy drop.	14M	CO3	L3
		UNIT–IV			
7.	a)	Classify the steam condensers.	7M	CO4	L4
	b)	Explain the sources of air and effects of air in a condenser?	7M	CO4	L2
		OR			
8.	a)	Explain the working of a natural draft cooling tower with a diagram.	7M	CO4	L3
	b)	Classify cooling towers and explain the need of cooling towers in steam power plants.	7M	CO4	L4
		UNIT–V			
9.	a)	Why compounding is necessary in the steam turbines? List out the types.	6M	CO5	L1
	b)	Explain pressure compounding in steam turbines with neat sketch	8M	CO5	L2
		OR			
10.		In a simple impulse turbine, the nozzles are inclined at 20^0 with the direction of motion of the moving blades. The steam leaves the nozzles at 400 m/s. The blade speed is 180 m/s. Find suitable inlet and outlet angles for the blades in order that the axial thrust is zero. The relative velocity of steam as it flows over the blades is reduced by 10 % due to friction. Determine also the power developed for a flow rate of 15 kg/s.	14M	CO5	L3

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