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Sr. No 013503

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B.Tech. V-SEMESTER

Design of Machine Elements- I (PCC-ME-503-21)

Time: 3 Hours

Max. Marks:75

- Instructions:**
1. It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.
 2. Answer any four questions from Part -B in detail.
 3. Different sub-parts of a question are to be attempted adjacent to each other.
 4. Use of design data handbook is allowed.

PART -A (भाग-ए)			
Q1	(a)	What are design considerations for casting?	(1.5)
	(b)	Explain factor of safety.	(1.5)
	(c)	What are different types of welded joints?	(1.5)
	(d)	Write applications of cotter joint.	(1.5)
	(e)	What are failure modes of key? Explain.	(1.5)
	(f)	Explain use of Oldham's coupling.	(1.5)
	(g)	What are different type of shafts?	(1.5)
	(h)	What is nipping in springs?	(1.5)
	(i)	How friction is useful in clutches? Explain.	(1.5)
	(j)	Draw a neat sketch of band brake.	(1.5)
PART -B भाग-बी			
Q2	(a)	Explain Soderberg, Goodman's and Gerber criteria for fatigue design.	(10)
	(b)	What are various factors to be considered for selection of factor of safety?	(5)
Q3	(a)	A tie-bar in a bridge consists of flat 350 mm wide and 20 mm thick. It is connected to a plate of the same thickness by a double cover butt joint. Design an economical joint if the permissible stresses are 90 MPa, 60 MPa and 150 MPa in tensile, shear and crushing respectively.	(10)
	(b)	Design a sleeve cotter joint against a given static load.	(5)
Q4		Design a flange coupling to transmit a torque of 250 N-m between two coaxial shafts. The shaft is made of alloy steel, flanges out of cast iron and bolts out of steel. Four bolts are used to couple the flanges. The shafts are keyed to the flange hub. The permissible stresses are given below: Shear stress on shaft =100 MPa Crushing stress on shaft =250 MPa Shear stress on keys =100 MPa Crushing stress on keys =250 MPa	(15)

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		Shearing stress on cast iron = 200 MPa Shear stress on bolts = 100 MPa After designing the various elements, make a neat sketch of the assembly indicating the important dimensions.	
Q5	(a)	A hollow shaft has greater strength and stiffness than solid shaft of equal weight. Explain.	(5)
	(b)	A solid circular shaft is subjected to a bending moment of 3000 N-m and a torque of 10 000 N-m. The shaft is made of steel having ultimate tensile stress of 700 MPa and a ultimate shear stress of 500 MPa. Assuming a factor of safety as 6, determine the diameter of the shaft.	(10)
Q6	(a)	A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity 84 KN/mm ² , find the axial load which the spring can carry and the deflection per active turn	(10)
	(b)	What do you understand by full length and graduated leaves of a leaf spring? Explain.	(5)
Q7	(a)	What are different types of clutches. Explain	(8)
	(b)	What are materials for brake lining? What are different characteristics for brake lining material?	(7)
