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Sir Issac Newton College of Engineering and Technology-Nagapattinam

MODEL EXAM

Fifth Semester

Mechanical Engineering

ME8593-DESIGN OF MACHINE ELEMENTS

Date: 01.12.2022
Time: 9.30 -12.30 AM

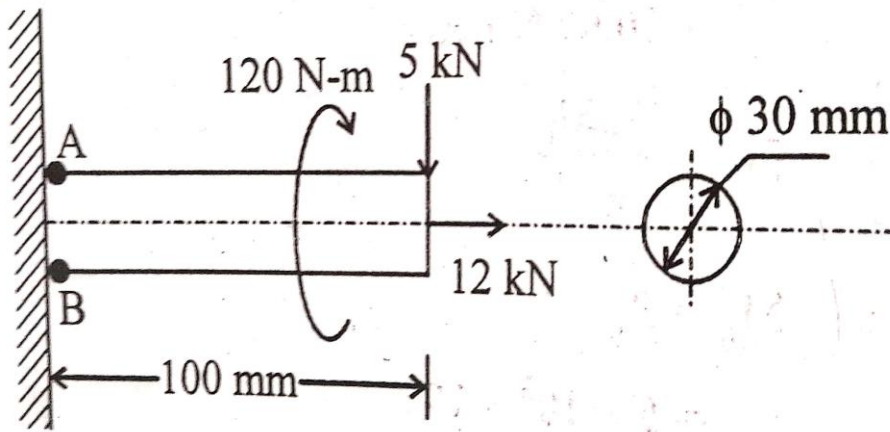
Session : FN
Maximum: 100 marks

Answer ALL Questions
PART - A (10 X 2 = 20 marks)

Q.NO	Questions	Marks	CO	BL	PO
1	What are the types of machine design?	2	CO1	L1	3
2	Distinguish hardness and toughness.?	2	CO1	L2	3
3	What are the common modes of failure?	2	CO2	L4	3
4	What is transmission shaft?	2	CO2	L4	3
5	Define pitch?	2	CO3	L2	3
6	What is thread angle?	2	CO3	L5	3
7	Define helical spring?	2	CO4	L5	3
8	Sketch the disc spring?	2	CO4	L2	3
9	List out the types of rolling contact bearing?	2	CO5	L2	3
10	State the advantages of sliding contact bearing?	2	CO5	L2	3

PART- B (5 X 13 = 65 marks)

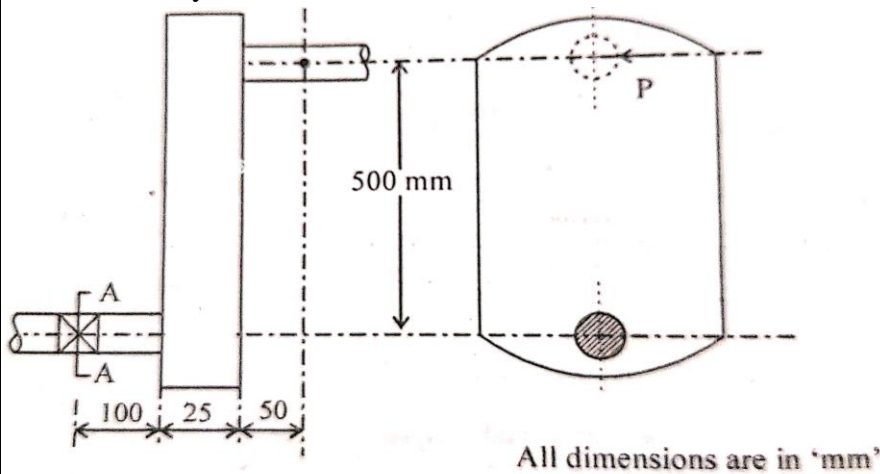
Q.NO	Questions	Marks	CO	BL	PO
11.	(a). A circular shaft of 30mm diameter is subjected to an axial load, bending moment and twisting moment as shown in figure. Determine the maximum principle stresses, minimum principle stress and maximum shear stress at point A and B	13	CO1	L3	3



Or

(b). In a crank pin, a force of 1000N acts at its center as shown in figure. the yield strength of the crank materials 400 N/mm². determine the diameter at section A-A, using the following failure theories.

- 1, Rankine theory
- 2, Guest's theory



13

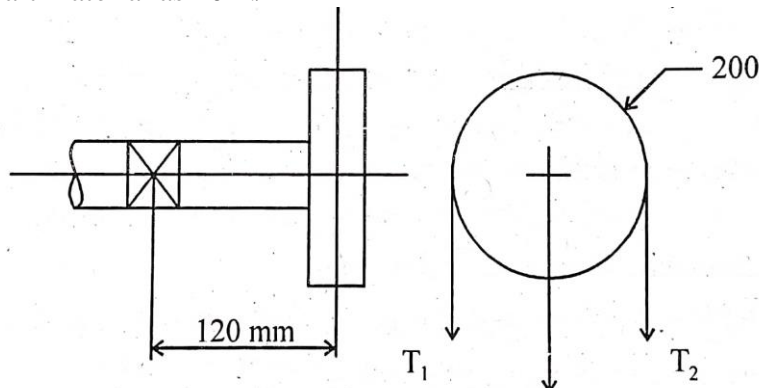
CO1

L3

3

12.

(a). Design a shaft to transmit 1.5 Kw at 125 Rpm from an electric motor to a lathe headstock through a pulley using flat belt drive. the pulley is located at 120 mm from the centre of the bearing .diameter of the pulley is 200mm.the pulley weight 225N.angle of lap of the belt is 180° and the coefficient of friction between belt and pulley is 0.3.shock factor in bending is 1.5 and in twisting 2.take allowable shear stress for the shaft material as 40 N/mm²

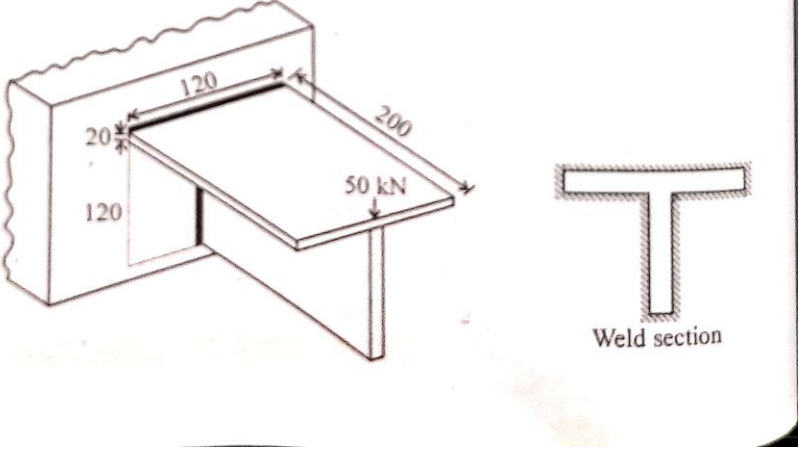


13

CO2

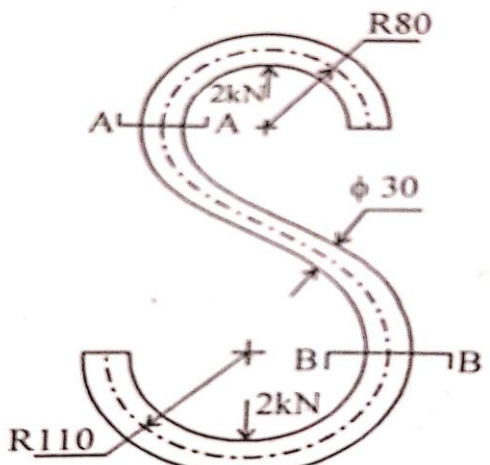
L3

3

	Or				
	<p>(b). Design a rigid flange coupling to transmit a torque of 250 mm between two co –axial shafts. the shaft is made of alloy steel, flange out of caste iron and bolts out of steel. four bolts are used to couple the flanges. the shaft are keyed to the flange hub. the permissible stresses are shear stress on shaft=100 MPa, bearing stress on keys=250 MPa, shear stress on keys=100MPa, bearing or crushing stress on keys=250MPa, shearing stress on cast iron=200MPa, shar stress on bolts=100MPa.after designing the various elements, make a neat sketch of the assembly indicating the important dimensions. the stresses developed in the various members may be checked if thumb rules are used for fixing the dimensions.</p>	13	CO2	L3	3
13.	<p>(a) A bracket of T cross section is welded to a plate as shown in figure. the load of 50kn is act eccentrically from the support plate . determine the size of weld. take shear is not exceed to 120 N/mm²</p> 	13	CO3	L3	3
	Or				
	<p>(b). A Knuckle Joint is to Transmit A Force Of 140 KN.. Allowable Stresses In Tension, Shear And Compression Are 75 N/sq, mm,65 N/sq, mm and 140 N/sq, mm respectively. design the joint</p>	13	CO3	L3	3
14.	<p>(a). Design a compression spring for a safety valve for the following data, valve operating pressure =1 N/mm²: diameter of the valve seat=100mm: $\tau = 500\text{N/mm}^2$: $G = 0.8 \times 10^5 \text{N/mm}^2$: the spring is to be kept in a casting of 115mm outer diameter. maximum lift of the springs is 5mm,when the pressure is 1.08N/mm²</p>	13	CO4	L3	3
	Or				
	<p>(b). A truck spring has 12 numbers of leaves, two of which are full length leaves. the spring supports are 1.05m apart and the central band is 85mm wide. the central load is to be 5.4kn with a permissible stress of 280mpa.determine the thickness and width of the steel spring leaves. the ratio of the total depth to width of the spring is 3.also determine the deflection of the spring.</p>	13	CO4	L3	3

15	(a). A 100 mm diameter full journal bearing supports a radial load of 5000N .the bearing is 100 mm long and the shaft operates at 400 Rpm .assume permissible minimum film thickness of 0.25mm and diametral clearance of 0.152mm.using Raimondi and boyd curves determine (a) viscosity of suitable oil,(b) co efficient of friction,(c) heat generated(d) amount of oil pumped through the bearing (e) amount of end leakage (f) temperature rise of the oil flowing through the bearing	13	CO5	L2	3
	(b).A ball bearing is to be used for a shaft whose speed is 400 Rpm. the radial load on the bearing is 4000N and the axial load is also 4000N.the bearing is to have a life 10000 hours at a reliability of 95%.determine the dynamic capacity of the bearing. Take $b=1.34$.also assume $F_a/C_o=0.5$	13	CO5	L1	3

PART- C (1 X 15 = 15 marks)

Q.NO	Questions	Marks	CO	BL	PO
16.	<p>(a). A S-link have a circular cross section is subjected to a load of 2 KN shown in figure. the diameter of the link is 30mm.determine the maximum tensile stress and maximum shear stress of the S-link</p> 	15	CO1	L3	3
	Or				
	<p>(b)The following data are given for a 360° hydrodynamic bearing. journal diameter =100mm, radial clearance=0.14mm, radial load=50KN. Bearing length=100mm, journal speed=1400Rpm and viscosity of lubricant=16CP, calculate</p> <p>(i) minimum film thickness</p> <p>(ii) co-efficient of friction</p> <p>(iii) power lost in friction</p>	15	CO5	L2	3

BT LEVEL		CO1	CO2	CO3	CO4	CO5	CO6	%
Remember	Q. Nos	1				15(b)		0.075
	Marks	2				13		
Understand	Q. Nos	2	15(b)	5,13(a)	8	9,10,16(b),15(a),16(b)		36.5
	Marks	2	13	13	2	43		
Applying	Q. Nos	11(a),11(b),16(a)	12(a),12(b)	13(a),13(b)	14(a),14(b)			58.5
	Marks	39	26	26	26			
Analyze	Q. Nos		3,4	6,7				4
	Marks		4	4				
Total		43	43	43	28	56		100

IQAC Member	HOD / Mech