Code No: P18MET11

HALL TICKET NUMBER

PACE INSTITUTE OF TECHNOLOGY & SCIENCES::ONGOLE
(AUTONOMOUS)
III B.TECH I SEMESTER END REGULAR EXAMINATIONS, DEC/JAN – 2022/23
DESIGN OF MACHINE ELEMENTS-I
(ME Branch)

Time: 3 hours   Max. Marks: 60

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A
Answer all the questions in Part-A (5X2=10M)

Q.No.		Questions	Marks	CO	KL
1.	a)	Write a short note on preferred numbers	[2M]	1	2
	b)	Draw S-N curve for ductile material	[2M]	2	2
	c)	State any two types of failures in riveted with neat sketch	[2M]	3	2
	d)	Define a shaft and an axle?	[2M]	4	1
	e)	What are the different stresses induced in mechanical springs?	[2M]	5	3

PART-B
Answer One Question from each UNIT (5X10=50M)

Q.No.		Questions	Marks	CO	KL
		UNIT-I			
2.	a)	Explain general considerations in Machine design?	[5M]	1	2
	b)	Explain different types of fits?	[5M]	1	3
		OR			
3.	a)	Explain about hole basis system and shaft basis system	[5M]	1	2
	b)	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 Maximum distortion energy theory of failure, and assuming a factor of safety of 2. Take E = 210 GPa and poisson's ratio = 0.25.	[5M]	1	3
		UNIT-II			
4.		What are the different methods to reducing stress concentration? Explain with neat sketch?	[10M]	2	2
		OR			
5.	a)	Explain the types of fluctuating stresses.	[5M]	2	2
	b)	A circular bar of 500 mm length is supported freely at its two ends. It is acted upon by a central concentrated cyclic load having a minimum value of 20 kN and a maximum value of 50 kN. Determine the diameter of bar by taking a factor of safety of 1.5, size effect of 0.85, surface finish factor of 0.9. The material properties of bar are given by ultimate strength of 650 MPa, yield strength of 500 MPa and endurance strength of 350 MPa.	[5M]	2	4
		UNIT-III			
6.	a)	Explain different types riveted joints with neat sketch?	[5M]	3	2

	b)	A double riveted double cover butt joint in plates 20 mm thick is made with 25 mm diameter rivets at 100 mm pitch. The permissible stresses are : σt = 120 MPa; τ = 100 MPa; σc = 150 Mpa Find the efficiency of joint, taking the strength of the rivet in double shear as twice than that of single shear.	[5M]	3	4
		OR			
7.	a)	What are the advantages and disadvantages of Welded Joints over Riveted Joints?	[5M]	3	2
	b)	A rectangular steel plate is welded as a cantilever to a vertical column and supports a single concentrated load P, as shown in Fig. Determine the weld size if shear stress in the same is not to exceed 140 MPa.	[5M]	3	4
		UNIT-IV			
8.	a)	Design a sleeve and cotter joint to resist a tensile load of 60 kN. All parts of the joint are made of the same material with the following allowable stresses : σt = 60 MPa ; τ = 70 MPa ; and σc = 125 MPa.	[5M]	4	4
	b)	Explain different types of sunk keys with neat sketches.	[5M]	4	2
		OR			
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 μ = 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.	[10M]	4	4
		UNIT-V			
10.	a)	Write the design procedure for flange coupling with neat sketch	[5M]	5	3
	b)	Design a clamp coupling to transmit 30 kW at 100 r.p.m. The allowable shear stress for the shaft and key is 40 MPa and the number of bolts connecting the two halves are six. The permissible tensile stress for the bolts is 70 MPa. The coefficient of friction between the muff and the shaft surface may be taken as 0.3.	[5M]	5	4
		OR			
11.	a)	What are the different types of springs? Explain with neat sketches.	[5M]	5	2
	b)	Closely coiled helical spring is made of 10 mm diameter steel wire, the coil consisting of 10 complete turns with a mean diameter of 120 mm. The spring carries an axial pull of 200 N. Determine the shear stress induced in the spring neglecting the effect of stress concentration. Determine also the deflection in the spring, its stiffness and strain energy stored by it if the modulus of rigidity of the material is 80 kN/mm².	[5M]	5	4

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