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KAMALA INSTITUTE OF TECHNOLOGY & SCIENCE, SINGAPUR

23ME28PC502

III.B. Tech. I. Semester Regular Examinations, November- 2025

DESIGN OF MACHINE ELEMENTS

(ME)

Time: 3 Hours

Max. Marks: 60

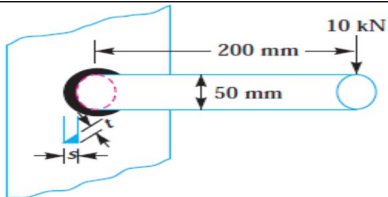
Note: Question paper consists of Part-A & Part-B.

i) **Part-A** for 10M, ii) **Part-B** for 50marks

- Part A** is compulsory, consists of 10 sub questions from all units carrying equal marks.
- Part-B** consists of **10 questions** (numbered from 2 to 11) carrying **10marks** each. From each unit there are 2 questions and the students should answer one of them. Hence the student should answer **5 questions** from **Part-B**.

PART-A (10Marks)			
Q. No	Questions	Marks	BTL
1.a)	What are the manufacturing considerations in design?	1	1
1.b)	Define factor of safety	1	1
1.c)	Illustrate the causes of stress concentration	1	2
1.d)	Define endurance limit	1	1
1.e)	What do you understand by the term welded joint?	1	1
1.f)	List the different types of riveted joints	1	1
1.g)	How are the keys classified	1	2
1.h)	Define a cotter joint	1	1
1.i)	How the shaft is designed when it is subjected to twisting moment?	1	2
1.j)	Classify the Shaft Couplings	1	1
PART-B (50Marks)			
Q.No	Questions	Marks	BTL

2. a)	Explain five theories of elastic failure for bi-axial loading system with the help of equations	5M	5
b)	The load on a bolt consists of an axial pull of 10 kN together with a transverse shear force of 5 kN. Find the diameter of bolt required according to 1. Maximum principal stress theory; 2. Maximum shear stress theory; 3. Maximum principal strain theory. Take permissible tensile stress at elastic limit = 100 MPa and poisson's ratio = 0.3.	5M	4
OR			
3. a)	Explain the following theories of failure. i) Rankine's Theory ii) Maximum Strain Energy Theory iii) Saint Venant's Theory.	10M	2
4. a)	Evaluate the different fluctuating stresses. Also, draw three stress–time curves for fluctuating stress	5M	3
b)	Discuss surface finish factor, size factor, reliability factor, modifying factor to account for stress concentration	5M	3
OR			
5. a)	Explain the Gerber curve, Goodman and the Soderberg line. Explain in detail with equations.	5M	2
b)	A steel rod is subjected to a reversed axial load of 180 kN. Find the diameter of the rod for a factor of safety of 2. Neglect column action. The material has an ultimate tensile strength of 1070 MPa and yield strength of 910 MPa. The endurance limit in reversed bending may be assumed to be one-half of the ultimate tensile strength. Other correction factors may be taken as follows: For axial loading = 0.7; For machined surface = 0.8 ; For size = 0.85 ; For stress concentration = 1.0.	5M	3
6. a)	Explain the design procedure for Riveted Joints under Eccentric Loading	5M	2
b)	Explain the design procedure for Bolted Joints under Eccentric Loading	5M	2
OR			
7. a)	Explain the design procedure for Welded Joints under Eccentric Loading	5M	2
b)	A 50 mm diameter solid shaft is welded to a flat plate as shown in Fig. If the size of the weld is 15 mm, find the maximum normal and shear stress in the weld	5M	3

			
8. a)	Discuss the design procedure of spigot and socket cotter joint in detail with figure	10M	3
OR			
9. a)	Discuss the design procedure of Sleeve and cotter joint in detail with figure.	5M	3
b)	Design and draw 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: $\sigma_t = 60 \text{ MPa}$; $\tau = 70 \text{ MPa}$; and $\sigma_c = 125 \text{ MPa}$.	5M	3
10.a)	Explain Shafts Subjected to Twisting Moment	5M	2
b)	A line shaft rotating at 200 r.p.m. is to transmit 20 kW. The shaft may be assumed to be made of mild steel with an allowable shear stress of 42 MPa. Determine the diameter of the Shaft.	5M	2
OR			
11.a)	Design a muff coupling to connect two shafts transmitting 40 kW at 120 r.p.m. The permissible shear and crushing stress for the shaft and key material (mild steel) are 30 MPa and 80 MPa respectively. The material of muff is cast iron with permissible shear stress of 15 MPa. Assume that the maximum torque transmitted is 25 per cent greater than the mean torque	10 M	4

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