R20 Regulation *Subject code:3P5CB*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech V Semester Supplementary Examinations, May 2025

DESIGN OF MACHINE MEMBERS-I

(ME)

Maximum Marks: 70 Date: 19.06.2025 Duration: 3 hours

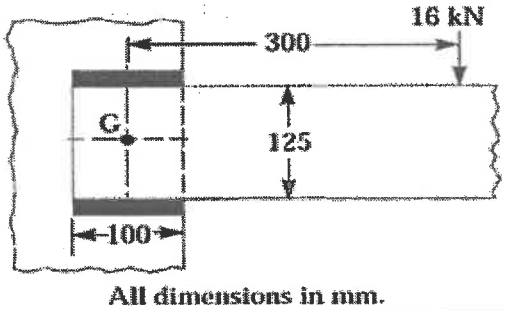
Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	Define factor of safety	2M	1	L1
2	Explain the methods to reduce stress concentration in machine members.	2M	1	L1
3	What is row pitch and margin of a riveted joint?	2M	2	L1
4	Explain Goodman failure theory	2M	2	L1
5	What do you mean by efficiency of riveted joint?	2M	3	L1
6	How do you classify the riveted joints?	2M	3	L1
7	Classify different types of keys.	2M	4	L1
8	Define the term throat area of the weld.	2M	4	L1
9	What are flexible couplings and what are their applications?	2M	5	L1
10	Define the term throat area of the weld.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	What are theories of failure. Explain any two theories of elastic failure for bi-axial loading system with the help of equations.	10M	1	L2
	OR			
12	A mild steel shaft of 50 mm diameter is subjected to a bending moment of 2000 Nm and a torque T. If the yield point of the steel in tension is 200 MPa, find the maximum value of this torque without causing yielding of the shaft according to (a) the maximum principal stress (b) the maximum shear stress and (c) the maximum distortion strain energy theory of yielding.	10M	1	L2
13	A solid circular shaft, 20mm in diameter, is subjected to torsional shear stress, which varies from 0 to 35 N/mm2and at the same time, is subjected to an axial stress that varies from -15 to +30 N/mm2. The frequency of variation of these stresses is equal to the shaft speed. The shaft is made of steel FeE 400(Sut=540 N/mm2and Syt=400 N/mm2and the corrected endurance limit of the shaft is 200 N/mm2. Determine the factor of safety.	10M	2	L2
	OR			
14	A leaf spring in an automobile is subjected to cyclical stresses. The average stress= 150 MPa, variable stress = 50 MPa, Ultimate stress = 630 MPa, Yield point stress = 350 MPa and endurance limit = 150 MPa.	10M	2	L2

	Estimate under what factor of safety the spring is working, by Goodman and Soderberg formulae.			
15	A double riveted, chain lap joint is to be made for joining two plates of 10 mm thick. The allowable stresses are 60 MPa in tension, 80 MPa in crushing and 50 MPa in shear. Determine the rivet diameter, pitch of the rivets and row pitch. Also find the efficiency of the joint.	10M	3	L2
	OR			
16	A 125 × 95 × 10 mm angle is welded to a frame by two 10 mm fillet welds, as shown in Figure. A load of 16 kN is applied normal to the gravity axis at a distance of 300 mm from the centre of gravity of welds. Find the maximum shear stress in the welds, assuming each weld to be 100 mm long and parallel to the axis of the angle. 	10M	3	L2
17	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: Tensile stress = 60 MPa, Shear stress = 70 MPa and crushing stress = 125 MPa.	10M	4	L2
	OR			
18	Design a socket and spigot type of cotter joint to sustain an axial load of 100kN. The material selected for the joint has the following design stresses. σt= 120 MPa, σc = 160 MPa and τ = 60 MPa	10M	4	L2
19	The engine of a ship develops 420 kW and transmits the power by a horizontal propeller shaft, which runs at 120 rpm. It is proposed to design a hollow propeller shaft with inner diameter as 0.6 of outer diameter. Considering the torsion alone calculate the diameter of the propeller shaft if stress in the material is not to exceed 63 N/mm2 and also the angular twist over a length of 2500 mm is not be more than 100. The modulus of the rigidity of the shaft material is 80 KN/mm2.	10M	5	L2
	OR			
20	Design and draw a muff coupling to transmit 50 HP at 120 rpm. The shaft and key are made of the same material having allowable shear stress of 30N/mm2and compressor stress of 80N/mm2. The flange is made, as cast Iron with allowable shear stress is 15N/mm2.	10M	5	L2