R20 Regulation *Subject code: 3P5CB*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Supplementary Examinations, November 2025

DESIGN OF MACHINE MEMBERS-I

(ME)

Maximum Marks: 70 Date: 20.11.2025 Duration: 3 hours

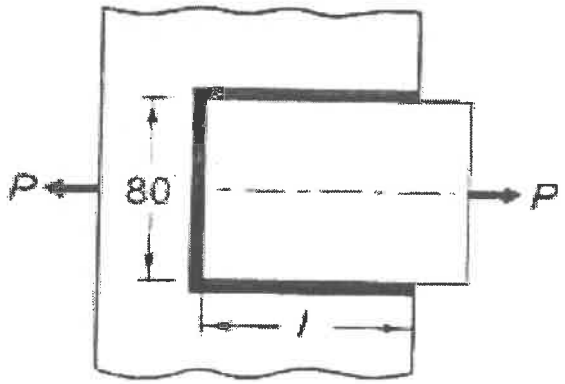
Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	List any four factors that govern selection of materials while designing a machine component.	2M	1	L1
2	With suitable example state when flexible coupling is preferred over the rigid coupling.	2M	1	L1
3	What is bolts of uniform strength?	2M	2	L1
4	Define BIS code.	2M	2	L1
5	Write the methods to reduce stress concentration in machine members.	2M	3	L1
6	How is a sunk key designed?	2M	3	L1
7	What do you mean by efficiency of riveted joint?	2M	4	L1
8	Write the modified Goodman diagram for Torsional shear stresses.	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) What are the general considerations in designing machine members. Discuss in detail. b) A simply supported shaft of 50 mm diameter and 0.5 m long is subjected to, at its mid-section, a load that varies cyclically from 2P to 4P. Determine the value of P. Yield strength=450 MPa, Endurance limit=350 Mpa, Factor of safety=2, size correction factor=0.85 and surface correction factor =0.9.	5M 5M	2	L2
	OR			

14	a) Describe the procedure to design an eccentrically loaded welded joint. b) 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.	5M 5M	2	L2
15	a) Explain how to design a bolt considering both initial tightening load and external force. b) A flanged bearing for a horizontal shaft is fastened to a frame by means of 4 bolts, equally spaced on 160 mm pitch circle diameter. A 100 kN force acts at a distance of 50 mm from the frame. The diameter of the flange is 220 mm. Determine the size of the bolts, if the tensile stress for the bolt material is 80 MPa.	5M 5M	3	L2
	OR			
16	A steel plate, 80 mm wide and 10 mm thick, is joined to another steel plate by meansof a single transverse and double parallel fillet weld, as shown below Fig. 1. Thestrength of the welded joint should be equal to the strength of the plate to be joined.The permissible tensile and shear stresses for the weld material and the plates are100 MPa and 70 MPa respectively. Find the length of each parallel fillet weld.Assume that the tensile force passes through the centre of gravity of three welds. 	10M	3	L2
17	A shaft, 40 mm in diameter is transmitting 35 KW power at 300 rpm by means of Kennedy keys of 10X10 mm cross section. The keys are made of steel 45C8 (Syt = Syc = 380 N/mm^2) and the factor of safety is 3.Determine the required length of the keys.	10M	4	L2
	OR			
18	It is required to design a knuckle joint to connect circular shafts subjected to an axial force of 50 KN. The rods are coaxial and a small amount of angular movement between their axes is permissible. Design the joint and specify the dimensions of its components. The allowable tensile, compressive and shear stress in the rod and pin material is limited to 80MPa, 100MPa and 40MPa respectively.	10M	4	L2

19	A steel solid shaft transmitting 15 kW at 200 rpm is supported on two bearings 750 mmapart and has two gears keyed to it. The pinion having 30 teeth of 5 mm module islocated 100 mm to the left of the right hand bearing and delivers power horizontally tothe right. The gear having 100 teeth of 5 mm module is located 150 mm to the right ofthe left hand bearing and receives power in a vertical direction from below. Using anallowable stress of 54 MPa in shear, determine the diameter of the shaft.	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/mm^2. The flange is made, as cast Iron with allowable shear stress is 15N/mm^2.	10M	5	L2