R18 Regulation *Subject code:2P5CA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Supplementary Examinations, April 2026

DESIGN OF MACHINE MEMBERS -I

(ME)

Maximum Marks: 70 Date: 15.04.2026 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	Write 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	What is the purpose of a gib?	2M	2	L1
5	How is a sunk key designed?	2M	3	L1
6	When do you consider column factor in design of shafts.	2M	3	L1
7	How is a flange coupling modified to make it flexible coupling.	2M	4	L1
8	What do you understand by bolt of uniform strength?	2M	4	L1
9	What information do you obtain from soderberg diagram?	2M	5	L1
10	What are the applications of cotter joint?	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	5M 5M	2	L2

	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.			
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	Design a knuckle joint to connect two circular rods subjected to an axial tensile force of 50 KN. The rods are co-axial and a small amount of angular movement between their axes is permissible. Assume permissible stresses as: σt =80 N/mm2 τ=40 N/mm^2; σc=80 N/mm^2.	10M	3	L2
17	a) Mention different types of cotter joints. Where are they used? b) Design a socket and spigot type cotter joint to resist a load of 25 kN. Assume safe stresses as: σt=50 MPa; allτ=40 MPa; σc=65 MPa.	5M 5M	4	L2
	OR			
18	a) Write how a shaft is designed on the basis of rigidity. b) A steel shaft 1.25 m long between bearings carries 1250 N pulley at its mid point. The pulley is keyed to the shaft and receives 20 kW at 200 rpm. The belt drive is horizontal and the ratio of the belt tensions is 3:1. The diameter of the pulley is 600 mm. Compute the shaft diameter.	5M 5M	4	L2
19	Two 40 mm diameter shafts running at 500 rpm and transmitting a torque of 1200 Nm are connected by a rigid un-protected type of flange coupling. The flanges are fitted with six bolts. Permissible stresses are 35 MPa in shear and 45 MPa in crushing. Design the coupling with a neat sketch.	10M	5	L2
	OR			
20	Design and draw a muff coupling to transmit 50HPat 120 rpm. The shaft and key are made of the same material having allowable shear stress of 30N/mm^2 and compressor stress of 80N/mm^2. The flange is made, as cast Iron with allowable shear stress is 15N/mm^2.	10M	5	L2