



R18 Regulation

Subject code:2P5CA

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: 17.06.2025

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	What are the steps in Machine Design Process?	2M	1	L1
2	Write about the stress concentration factor?	2M	1	L1
3	Write the Goodman's Equation.	2M	2	L1
4	Write about the preferred Numbers?	2M	2	L1
5	Write about the failure of the riveted joints?	2M	3	L1
6	Write the difference between riveted joints and welding joints?	2M	3	L1
7	What are the functions of key?	2M	4	L1
8	What is sunk key?	2M	4	L1
9	What is coupling? Where do you use it?	2M	5	L1
10	What is the function of transmission shaft?	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	Explain the procedure for Engineering Design process.	10M	1	L2
OR				
12	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 two different theories of failure, and assuming a factor of safety of 2. Take E = 210 GPa and poisson's ratio = 0.25.	10M	1	L2
13	Find the diameter of a shaft to transmit twisting moments varying from 800 N-m to 1600 N-m. The ultimate tensile strength for the material is 600 MPa and yield stress is 450 MPa. Assume the stress concentration factor = 1.2, surface finish factor = 0.8 and size factor = 0.85.	10M	2	L2
OR				
14	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 factor 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.	10M	2	L2

15	Explain the various ways in which a riveted joint may fail?	10M	3	L2
OR				
16	Find the efficiency of the riveted joint Single riveted lap joint of 6 mm plates with 20 mm diameter rivets having a pitch of 50 mm. Assume Permissible tensile stress in plate = 120 MPa Permissible shearing stress in rivets = 90 MPa Permissible crushing stress in rivets = 180 MPa.	10M	3	L2
17	A 45 mm diameter shaft is made of steel with a yield strength of 400 MPa. A parallel key of size 14 mm wide and 9 mm thick made of steel with a yield strength of 340 MPa is to be used. Find the required length of key, if the shaft is loaded to transmit the maximum permissible torque. Use maximum shear stress theory and assume a factor of safety of 2.	10M	4	L2
OR				
18	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 : $\sigma_t = 60$ MPa ; $\tau = 70$ MPa ; and $\sigma_c = 125$ MPa.	10M	4	L2
19	A solid circular shaft is subjected to a bending moment of 3000 N-m and a torque of 10 000 N-m. The shaft is made of 45 C 8 steel having ultimate tensile stress of 700 MPa and a ultimate shear stress of 500 MPa. Assuming a factor of safety as 6, determine the diameter of the shaft.	10M	5	L2
OR				
20	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.	10M	5	L2