



Regulation R17
TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous, Accredited by NAAC with 'A' Grade)

Subject code: 1P5CA

B.Tech III Year I Semester Supplementary Examinations, December 2021
DESIGN OF MACHINE MEMBERS-I

(Mechanical Engineering)

Maximum Marks: 70

Date: 23.12.2021 Duration: 3 hours

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 Define factor of safety.
- 2 Explain the methods to reduce stress concentration in machine members.
- 3 What is row pitch and margin of a riveted joint?
- 4 Explain the purpose of a gib.
- 5 How is a sunk key designed?
- 6 When do you consider column factor in design of shafts?
- 7 How is a flange coupling modified to make it flexible coupling?
- 8 What do you understand by bolt of uniform strength?
- 9 What information do you obtain from Soderberg diagram?
- 10 What are the applications of cotter joint?

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 What are theories of failure. Explain any two theories of elastic failure for bi-axial loading system with the help of equations. (10M)

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)

- 13 With neat sketch explain how the Soderberg and Goodman lines differ from each other. (10M)

OR

- 14 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. (10M)

- 15 a) Explain how to design a bolt considering both initial tightening load and external force. (5M)
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)

OR

- 16 A double riveted lap joint is made between 16mm thick plates. The rivet diameter and pitch are 20mm and 80mm respectively. If the permissible stresses are 80MPa in tension, 60MPa in shear and 120MPa in crushing, find the minimum force per pitch which will rupture the joint. (10M)
- 17 a) Mention different types of cotter joints. Where are they used? (5M)
b) Design a socket and spigot type cotter joint to resist a load of 25 kN. Assume safe stresses as: $\sigma_t=50$ MPa; $\tau=40$ MPa; $\sigma_c=65$ MPa. (5M)

OR

- 18 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: $\sigma_t=80$ N/mm²; $\tau=40$ N/mm²; $\sigma_c=80$ N/mm². (10M)
- 19 Two 40 mm diameter shafts running at 500 rpm and transmitting a torque of 1200 Nm are connected by a rigid unprotected 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)

OR

- 20 a) Write how a shaft is designed on the basis of rigidity. (5M)
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)