



Regulation R17

Subject code: 1P5CA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Year I Semester Supplementary Examinations, January 2023

Design Of Machine Members – I (Mechanical Engineering)

Maximum Marks: 70

06-01-2023

Duration: 3 Hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
 3. Part B consists of 10 questions. Answer any 5 questions which carries 12M.
 4. Each question carries 12marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 Define Machine Design
- 2 What is stress concentration?
- 3 What are the types of butt joints in welding?
- 4 What is fatigue failure?
- 5 What is fillet joint?
- 6 Define Design Synthesis.
- 7 What are the functions of key?
- 8 What is sunk key?
- 9 What is coupling? Where do you use it?
- 10 What is the function of transmission shaft?

Part-B

Answer all the questions

(5X10M=50Marks)

- 11 The load on a bolt consists of an axial pull of 10 kN together with a transverse shear force of 5 kN. Find the diameter of bolt required according to 1. Maximum principal stress theory; 2. Maximum shear stress theory. Take permissible tensile stress at elastic limit = 100 MPa and Poisson's ratio = 0.3. [10]

OR

- 12 What are the general considerations in designing machine members? Discuss in detail. [10]
- 13 A machine component is subjected to a flexural stress which fluctuates between + 300 MN/m² and - 150 MN/m². Determine the value of minimum ultimate strength according to 1. Gerber relation; 2. Modified Goodman relation; and 3. Soderberg relation. Take yield strength = 0.55 Ultimate strength; Endurance strength = 0.5 Ultimate strength; and factor of safety = 2. [10]

OR

- 14 Explain the significance of Goodman's line and Soderberg line in design of members subjected to reversal of stresses? [10]
- 15 Explain the various ways in which a riveted joint may fail. [10]

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. [10]
- 17 Design the rectangular key for a shaft of 50 mm diameter. The shearing and crushing stresses for the key material are 42 MPa and 70 MPa. [10]

OR

- 18 Find the diameter of a solid steel shaft to transmit 20 kW at 200 r.p.m. The ultimate shear stress for the steel may be taken as 360 MPa and a factor of safety as 8. If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameter when the ratio of inside to outside diameters is 0.5. [10]
- 19 Design and draw a cottered foundation bolt which is subjected to a maximum pull of 50 kN. The allowable stresses are : $\sigma_t = 80$ MPa ; $\tau = 50$ MPa ; and $\sigma_c = 100$ MPa. [10]

OR

- 20 Design and make a neat dimensioned sketch of a muff coupling which is used to connect two steel shafts transmitting 40 kW at 350 r.p.m. The material for the shafts and key is plain carbon steel for which allowable shear and crushing stresses may be taken as 40 MPa and 80 MPa respectively. The material for the muff is cast iron for which the allowable shear stress may be assumed as 15 MPa. [10]