R17 Regulation *Subject code:1P5CA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Year I Semester Regular Examinations, NOV/DEC 2019

DESIGN OF MACHINE MEMBERS – I

(MECHANICAL ENGINEERING)

Maximum Marks: 70 Date: 25.11.2019 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 which carries 10M.
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)**

1. Define stress concentration factor.
2. Compare strength and stiffness.
3. What is endurance limit?
4. Write the Soderberg's equation.
5. How is a bolt designated? Give examples.
6. Name the possible modes of failure in riveted joints.
7. What is a key? State its function.
8. Distinguish between a cotter and knuckle joint.
9. Mention the advantages of hollow shaft over a solid shaft.
10. Sketch a protective type flange coupling and indicate leading dimensions for a shaft of diameter'd'.

Part-B

Answer All the following questions. **(10MX 5=50Marks)**

1. Give an elaborate account of the various desirable mechanical properties of engineering materials. (10 marks)

(OR)

2. Discuss the various elastic theories of biaxial failure. (10 marks)

3. (a) Describe the fluctuating and repeated stresses with necessary diagrams. (5 marks)
(b) A rotating bar is made of 45C8 steel having an ultimate tensile strength of 630 N/mm^2. It is subjected to completely reversed bending stresses. Calculate fatigue strength of bar for a life of 90,000 cycles, if the endurance limit is 315 N/mm^2. (5 marks)

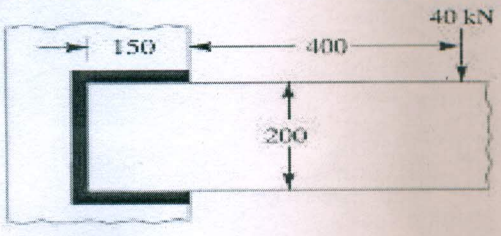
(OR)

4. An automobile engine part rotates and transmits power. During each rotation, stress varies from 20,000 psi to 1000 psi. Assume S_u = 80,000 psi, S_{yp} = 60,000 psi and S_e = 28,000 psi. Assuming K = K_f = 1. Find Nfs using (i) Soderberg's equation (ii) Goodman's equation and (iii) Modified Goodman's equation. (10 marks)

5. A flanged bearing for a horizontal shaft is fastened to a frame by means of 4 bolts, equally spaced on 180 mm pitch circle diameter. A 110 KN force acts at a distance of 45 mm from the frame. The diameter of the flange is 240 mm. Determine the size of the bolts, if the tensile stress for the bolt material is 85 MPa. (10 Marks)

(OR)

6. A bracket shown in Figure below carries a load of 40 KN. Calculate the size of weld, if the allowable shear stress is not to exceed 80 MPa. (10 Marks)



All dimensions in mm.

7. Design a cotter joint to connect two mild steel rods for a pull of 30 KN. The maximum permissible stresses are 55 MPa in tension, 40 MPa in shear and 70 MPa in crushing. Draw a neat sketch of the joint designed. (10Marks)

(OR)

8. Design a knuckle joint to connect two mild steel bars under a tensile load of 25 KN.The allowable stresses are 65 MPa in tension, 50 MPa in shear and 83 MPa in crushing. (10 Marks)

9. A mild steel shaft transmits 20 kW at 200 rpm. It carries a central load of 900N and is simply supported between the bearings 2.5 meters apart. Determine the size of the shaft, if the allowable shear stress is 42 MPa and the maximum tensile or compressive stress is not to exceed 56 MPa. What size of the shaft will be required, if it is subjected to gradually applied loads? (10Marks)

(OR)

10. Design a cast iron protective flange coupling to connect two shafts in order to transmit 7.5 kW at 720 rpm. The following permissible stresses may be used: Permissible shear stress for shaft, bolt and key material is 33 MPa. Permissible crushing stress for bolt and key material is 60 MPa. Permissible shear stress for the cast iron is 15 MPa. (10 Marks)