R17 Regulation *Subject code: 1P5CA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Supplementary Examinations, June/July 2023

Design of Machine Members -I

(Mechanical Engineering)

Maximum Marks: 70 Duration: 3 hours 23.06.23

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)

1 Define strength
2 What is fatigue life?
3 Define Poisson ratio.
4 What is reversed stress? Draw a stress–time curve for reversed stress.
5 What is a tap bolt?
6 Explain the various types failures of Riveted Joints?
7 Describe the various types of keys and advantages of the keys ?
8 Explain about the woodruff key and Feathers key with neat sketch?
9 List out the various types of couplings and its Functions of couplings?
10 What is the function of transmission shaft?

Part-B

Answer All the following questions. (5X10M=50Marks)

11 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]

OR

12 What are theories of failure? Explain any two theories of elastic failure for bi-axial loading system with the help of equations. [10M]

13 Derive the Equation of Goodman's Equation for combination of stresses? [10M]

OR

14 Determine the thickness of a 120 mm wide uniform plate for safe continuous operation if the plate is to be subjected to a tensile load that has a maximum value of 250 kN and a minimum value of 100 kN. The properties of the plate material are as follows: Endurance limit stress = 225 MPa, and Yield point stress = 300 MPa. The factor of safety based on yield point may be taken as 1.5. [10M]

15 Explain the various ways in which a riveted joint may fail? [10M]

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]

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. [10M]

OR

18 Design and draw a cotter joint to support a load varying from 30 kN in compression to 30 kN in tension. The material used is carbon steel for which the following allowable stresses may be used. The load is applied statically. Tensile stress = compressive stress = 50 MPa ; shear stress = 35 MPa and crushing stress = 90 MPa. [10M]

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. [10M]

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. [10M]