Reg. No. : | | | | | | | | | | |

Question Paper Code: 35703

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Fifth Semester

Mechanical Engineering

01UME503 – DESIGN OF MACHINE ELEMENTS

(Approved Design Data book is permitted)

(Regulation 2013)

Duration: One hour Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. The stress which vary from a minimum value to a maximum value of the same nature (i.e. tensile or compressive) is called

   (a) Repeated stress (b) Yield stress
   (c) Fluctuating stress (d) Alternating stress

2. The bending stress in a curved beam is

   (a) Zero at the centroidal axis (b) Zero at the point other than centroidal axis
   (c) Maximum at the neutral axis (d) Minimum at the neutral axis

3. A keyway lowers

   (a) The strength of the shaft
   (b) The rigidity of the shaft
   (c) Both the strength and rigidity of
   (d) The ductility of the material the shaft of the shaft

4. The sleeve or muff coupling is designed as a

   (a) thin cylinder (b) thick cylinder
   (c) solid shaft (d) hollow shaft

5. The transverse fillet welded joints are designed for

(a) Tensile strength (b) Compressive strength
(c) Bending strength (d) Shear strength

6. The parallel fillet welded joint is designed for _____

(a) tensile strength (b) compressive strength
(c) bending strength (d) shear strength

7. When helical compression spring is cut into halves, the stiffness of the resulting spring will be

(a) same (b) double (c) one-half (d) one-fourth

8. The stress in the full length leaf is _____% more than the stress induced in the graduated leaf

(a) 50% (b) 25% (c) 40% (d) 0%

9. When the length of the journal is equal to the diameter of the journal, then the bearing is said to be a

(a) short bearing (b) long bearing
(c) medium bearing (d) square bearing

10. The ball bearings are usually made from

(a) low carbon steel (b) medium carbon steel
(c) high speed steel (d) chrome nickel steel

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

11. A cantilever beam of circular cross section is fixed at one end and subjected to completely reversed force of 10*kN* at the free end. The force is perpendicular to the axis of the beam. The distance between free and fixed ends is 100*mm*. The beam is made of steel with ultimate tensile strength of 540 *MPa*. And tensile yield strength of 320*MPa*. The construction of the cantilever is such that there is no stress concentration. The size factor, surface finish factor and reliability factor are 0.85, 0.8, and 0.868 respectively. The operating temperature is 50^0C for which the temperature factor is 1.010. If the diameter of the beam is 35*mm* determine the life of the beam. (8)

12. Design a rigid type of flange coupling to connect two shafts. The input shaft transmits 37.5 *kW* power at 180 *rpm* to the output shaft through the coupling. The service factor for the application is 1.5. Select suitable material for various parts of the coupling. (8)

13. 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. (8)

14. Design a leaf spring for the following specifications : Total load = 140 kN ; Number of springs supporting the load = 4 ; Maximum number of leaves = 10; Span of the spring = 1000 mm ; Permissible deflection = 80 mm. Take Young's modulus, E = 200 kN/mm2 and allowable stress in spring material as 600 MPa. (8)

15. Load on a hydrodynamic full journal bearing is 30 *kN*. The diameter and speed of the shaft are 150 *mm* and 1200 *mm* respectively. Diametral clearance 0.2 *mm*. Sommerfield number is 0.631. L/D ratio 1:1. Calculate temperature rise of oil, quantity of the oil, and amount of heat generated. (8)