[Total No. of Questions - 9] [Total No. of Printed Pages - 4] (2125)

15171

B. Tech 5th Semester Examination

Machine Design-I (ME) (NS)

ME-314

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : (i) Assume any data if necessary.

(ii) Attempt one question from each section A, B, C and D.

(iii) Section E is Compulsory.

(iv) Use of Design Data book is permitted.

SECTION - A

1. (a) Explain the following Properties:

(i) Elasticity (ii) Creep (iii) Toughness

(iv) Machinability (v) Fatigue (10)

(b) What are fits and tolerances? How they are designated? (5)

(c) What do you understand by the following designation of materials?

(i) 30Cr13 (ii) 10C8S10 (iii) FeE650

(iv) 15Cr16Ni2 (v) 27Mn2 (5)

2. Calculate the tolerances, fundamental deviations and limits of sizes for the shaft designated as 40 H8/f7. (20)

[P.T.O.]

SECTION - B

3. A 45 mm diameter shaft is made of steel with a yield strength of 400 MPa. A parallel key of size 14 mm wide and 9 mm thick made of steel with a yield strength of 340 MPa is to be used. Find the required length of key, if the shaft is located to transmit the maximum permissible torque. Use maximum shear stress theory and assume a factor of safety of 2. (20)

4. A horizontal nickel steel shaft rests on two bearings, A at the left and B at the right end and carries two gears C and D located at distances of 250 mm and 400 mm respectively from the center line of the left and right bearings. The pitch diameter of the gear C is 600 mm and that of gear D is 200 mm. The distance between the center line of the bearings is 2400 mm. The shaft transmits 20 kW at 120 rpm. The power is delivered to the shaft at gear C and is taken out at gear D in such a manner that the tooth pressure F_{tc} of the gear C and F_{td} of the gear D act vertically downwards. Find the diameter of the shaft, if the working stress is 100 MPa in tension and 56 MPa in shear. The gear C and D weighs 950 N and 350 N respectively. The combined shock and fatigue factors for bending and torsion may be taken as 1.5 and 1.2 respectively. (20)

SECTION - C

5. A double threaded power screw, with ISO metric trapezoidal threads is used to raise a load of 300 kN. The nominal diameter is 100 mm and the pitch is 12 mm. the coefficient of friction at the screw threads is 0.15. Neglecting collar friction, calculate

(i) Torque required to raise the load.

(ii) Torque required to lower the load

(iii) Efficiency of the screw. (20)

6. A rectangular steel plate is welded as a cantilever to a vertical column and supports a single concentrated load P, as shown in fig. 1. Determine the weld size if shear stress in the same is not to exceed 140 MPa. (20)

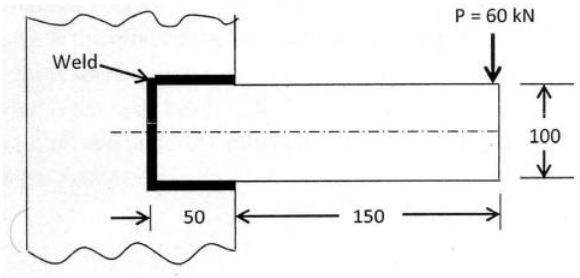

Figure 1

SECTION - D

7. Two mild steel rods are connected by a knuckle joint to transmit an axial load of 150 kg. Design the joint completely. Take the material of joint as C-40 and factor of safety as 2. (20)

8. (a) A cast iron pipe of internal diameter 200 mm and thickness 50 mm carries water under a pressure of 5 N/mm^2. Calculate the tangential and radial stresses at radius (r) = 100 mm; 110 mm; 120 mm; 130 mm; 140 mm; 150 mm. Sketch the stress distribution curves. (15)

   (b) A seamless pipe carries 2400 m^3 of steam per hour at a pressure of 1.4 N/mm^2. The velocity of flow is 30 m/s. Assuming the tensile stress as 40 MPa, find the inside diameter of the pipe and its wall thickness. (5)

SECTION - E

9. Attempt the following question.

   (i) How do you classify materials for engineering use?

   (ii) What do you understand by the single start and double start threads?

   (iii) Distinguish between cotter joint and knuckle joint.

   (iv) What is an eccentric loaded welded joint?

   (v) What is an eccentric riveted joint?

   (vi) What is the effect of keyway cut into the shaft?

   (vii) What is splined shaft?

   (viii) What is Kennedy key?

   (ix) What do you understand by spigot and socket joint?

   (x) What is DFMA? (2×10=20)