10AU63

Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020

Design of Machine Elements – II

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer any FIVE full questions, selecting*
at least TWO questions from each part.
2. *Missing data may be suitably assumed.*
3. *Use of data hand book is permitted.*

PART – A

1 a. Write the difference between straight beam and curved beam. **(04 Marks)**
   b. Determine the value of 'b_1' in the I-cross section of a curved beam shown in Fig.Q1(b). Such that the normal stresses due to bending at extreme inner and outer fibres are numerically equal.
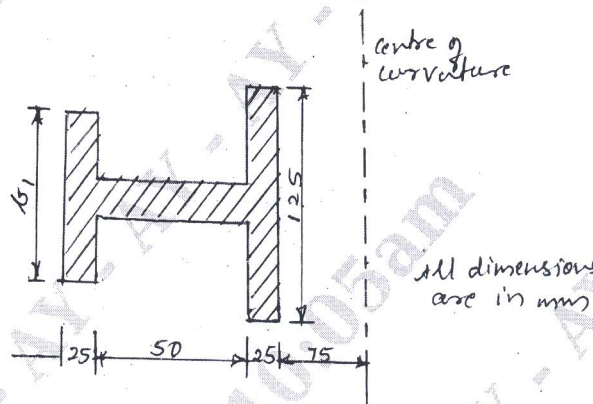

Fig.Q1(b)   **(16 Marks)**

2 a. A cast steel cylinder of 300 mm diameter is to contain liquid at pressure of 12.5 MPa. It is closed at both ends by unstayed flat cover plates rigidly bolted to shell flange. Determine the thickness of the cover plate if the allowable stress for the cover material is 75 MPa.
   (06 Marks)

   b. A tube with 50 mm and 75 mm inner and outer diameter respectively is reinforced by shrinking a jacket of outer diameter 100 mm. the compound tube has to withstand an internal pressure of 35 MPa. Calculate the shrinkage allowance such that the maximum tangential stress at each tube has same magnitude. Also calculate the shrinkage pressure. Assume E = 207 GPa. **(14 Marks)**

3 a. A railway wagon weighing 3 tonnes is moving with a velocity 3 m/s. It is brought to rest by two buffer springs of 200 mm diameter. The maximum deflection allowed is 160 mm. the allowable shear stress in spring material is 600 MPa. Take G = 84 GPa. Design the spring.
   (12 Marks)

   b. A semi elliptical laminated spring with two full length leaves and eight graduated leaves are to be designed to support 1.5 m apart with central band width of 500 mm. The central load on spring is 10 kN. All the leaves have same stress at full load condition. The maximum stress in leaves is 350 MPa. Calculate the width and thickness of leaves. **(08 Marks)**

4 a. Determine the dimensions of a simple cone clutch to transmit 20 KW at 1000 rpm. The minimum diameter is to be 300 mm and the cone angle 20°. Assume the coefficient of friction is 0.2 and permissible pressure is 0.1 MPa. Also determine the axial force required to engage clutch. **(10 Marks)**

b. A simple band brake as shown in Fig.Q4(b) is to be designed to absorb a power of 30 kW at a rated speed of 750 rpm. Determine:
   i) The effort required to stop clockwise and anticlockwise rotation of brake drum.
   ii) The dimensions of the rectangular cross-section of the brake lever assuming its depth to be twice the width.
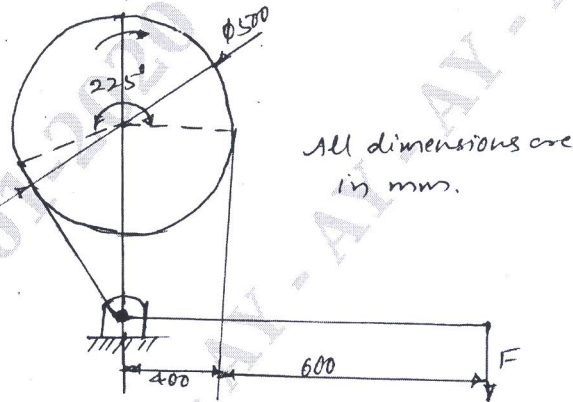

Fig.Q4(b) **(10 Marks)**

PART – B

5 a. Explain briefly the formative number of teeth in helical gears. **(05 Marks)**

b. Design a $14\frac{1}{2}^{\circ}$ involute spur gear to transmit 20 kW at 1200 rpm of the pinion. The gear ratio is 3:1 and the center distance is 400 mm. The pinion is made of C30 heat treated steel and the gear of 0.3% C heat treated forged steel. The drive is to be safe for continuous operation. **(15 Marks)**

6 A pair of bevel gears are to transmit 15 KW at 1500 rpm input speed. The number of teeth on pinion is 20 and the speed ratio is 5. Design the gears assuming $14\frac{1}{2}^{\circ}$ full depth form. **(20 Marks)**

7 a. List the different forms of lubrication and bearing materials. **(06 Marks)**

b. Design a full journal bearing subjected to 6 kN at 1000 rpm of the journal. The journal is of hardened steel and the bearing is of babbit material. The bearing is operated with SAE oil at 70°C and the ambient temperature is 30°. Also determine the amount of artificial cooling required. **(14 Marks)**

8 a. List the advantages of flat belt. **(06 Marks)**

b. The drive from a motor to a machine consist of three V-belts of type-B. The motor pulley has a pitch diameter of 160 mm, while that of the machine pulley is 500 mm. If centre distance is 1.3 m, determine the specifications of V-belt. **(14 Marks)**

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