G 1035 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2015

Seventh Semester

Branch : Automobile Engineering

AU 010 701/ ME 010 701—DESIGN OF MACHINE ELEMENTS (AU, ME)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Use of approved Design Data book is permitted.
Any missed data may suitably be assumed.
Answer **all** *questions.*
Each question carries 25 *marks.*

1. A SAE 1045 steel rod of σ_y = 309.9 M Pa with 80 mm diameter is subjected to a bending moment of 3 kN-m and torque T. Taking factor of safety as 2.5, find the maximum value of torque 'T' that can be safely carried by rod according to : (i) Maximum normal stress theory ; (ii) Maximum shear stress theory.

Or

2. A simply supported shaft carries a pulley at the center. The torque on pulley varies between 120 N-m and 200 N-m and the bending moment varies between 300 N-m and –150 N-m. The material of shaft has an ultimate stress of 600 MPa and yield stress of 450 MPa. Endurance stress may be taken as half the ultimate stress. The stress concentration factor for the shaft is 1.3 in bending and 1.2 in torsion. Take factor of safety as 1.8. The size and surface factors are 0.83 and 0.9 respectively.

3. Design a triple riveted zigzag lap joint to connect two plates each 12 mm thick. Draw a neat sketch of the joint.

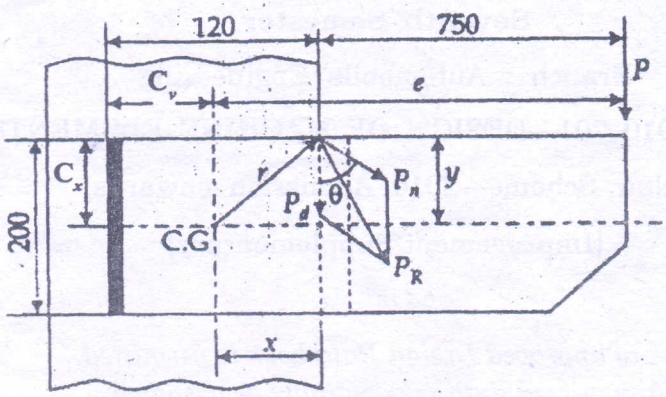
Or

4. A sluice gate weighing 500 kN is raised at a speed of 6 m/min by two screw rods with square threads 50 × 8 mm. The two screw rods are driven by bevel gears and motor.

   Determine : (i) torque required to raise the gate ; (ii) Speed of rotation of the screw rod assuming the threads are triple start ; (iii) maximum stresses induced in the screw ; (iv) efficiency of the screw ; (v) Length of nuts required to support to load taking the allowable bearing pressure as 12 MPa ; (vi) check for overhaul.

Turn over

5. Determine the load carrying capacity of a welded joint as shown in figure below. The size of weld is 10 mm and allowable shear stress in the weld is 66 MPa.



Or

6. Design a helical spring for a safety valve. The valve must blow off at a pressure of 1.2 MPa and should lift by 3 mm for 5 % increase in pressure. The valve diameter is 60 mm. The maximum allowable shear stress is 400 MN/m^2 and the modulus of rigidity is 82.7 GPa. Assume the spring index as 8.

7. A steel shaft 0.9 m long between bearings receives power of 18 kW at 900 r.p.m through a 20° involute gear of 2mm module and 100 teeth located at 250 mm to the left of the left bearing and is driven by a gear placed directly behind it. The power is transmitted by a 400 mm diameter pulley to another pulley placed behind and above it at an angle of 45° to horizontal. The pulley is located at a distance of 300 mm to the left of right bearing. The tension ratio is 2.7. Design a hollow shaft taking allowable shear stress as 72 MPa and diameter ratio as 2.0.

Or

8. Design a protected type flange coupling to transmit power between two shafts 40 mm and 50 mm. The allowable shear stress for shaft and bolts is 60 MPa. The allowable shear stress and bearing stress for key are 54 MPa and 120 MPa respectively. For CI flange, the allowable shear stress is 6 MPa.

(4 × 25 = 100 marks)