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BIME-008

B.Tech. – VIEP – MECHANICAL ENGINEERING (BTMEVI)

00935 **Term-End Examination**
December, 2014

BIME-008 : MACHINE DESIGN – I

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Use of scientific calculator is permitted. Use of standard Machine Design Data Book is permitted.*

1. Design a knuckle joint to transmit 150 kN. The design stress may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression. *14*

2. Two 35 mm shafts are connected by a flanged coupling. The flanges are fitted with 6 bolts on 125 mm bolt circle. The shaft transmits a torque of 800 N-m at 350 rpm. For the safe stresses mentioned below, calculate the

   (a) diameter of bolts
   (b) thickness of flanges
   (c) key dimensions
   (d) hub length
   (e) power transmitted

   Safe shear stress for shaft material = 63 MPa; Safe stress for C.I. coupling = 10 MPa; Safe stress for bolt material = 56 MPa; Safe stress for key material = 46 MPa. *14*

3. Find the diameter of a solid steel shaft to transmit 20 kW at 200 rpm. The ultimate shear stress for steel may be taken as 360 MPa and a factor of safety as 8.

If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameter when the ratio of inside to outside diameters is 0·5. *14*

4. The cutter of a broaching machine is pulled by square threaded screw of 55 mm external diameter and 10 mm pitch. The operating nut takes the axial load of 400 N on a flat surface of 60 mm and 90 mm internal and external diameters respectively. If the coefficient of friction is 0·15 for all contact surfaces on the nut, determine the power required to rotate the operating nut when the cutting speed is 6 m/min. Also find the efficiency of the screw. *14*

5. Design a spring for a balance to measure 0 to 1000 N over a scale of length 80 mm. The spring is to be enclosed in a casting of 25 mm diameter. The approximate number of turns is 30. The modulus of rigidity is 85 kN/mm^2. Also calculate the maximum shear stress induced. *14*

6. Find the efficiency of the following riveted joints : *14*

   (a) Single riveted lap joint of 6 mm plates with 20 mm diameter rivets having a pitch of 50 mm.

   (b) Double riveted lap joint of 6 mm plates with 20 mm diameter rivets having a pitch of 65 mm.

   Permissible tensile stress in plates = 120 MPa

   Permissible shearing stress in rivets = 90 MPa

   Permissible crushing stress in rivets = 180 MPa

7. Write short notes on any ***two*** of the following : 7+7

(a) Concurrent Engineering

(b) Creep and fatigue considerations in machine design

(c) Various types of welded joints used in pressure vessels

(d) Design procedure of a spigot and socket cotter joint