

**B.Tech. – VIEP – MECHANICAL ENGINEERING
(BTMEVI)****Term-End Examination****December, 2015****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 Design Data Book is permitted. Assume missing data suitably.

1. Design a knuckle joint to connect two mild steel bars under a tensile load of 25 kN. The allowable stresses are 65 MPa in tension, 50 MPa in shear and 83 MPa in crushing. Draw a neat sketch of the joint designed. 14

2. A mild steel cover plate is to be designed for an inspection hole in the shell of pressure vessel. The hole is 120 mm in diameter and the pressure inside the vessel is 6 N/mm^2 . Design the cover plate along with the bolts. Assume allowable tensile stress for mild steel as 60 MPa and for bolt material as 40 MPa. 14

3. What are the various permanent and detachable fastenings ? Give a complete list with various types of each category, along with neat sketches. 14
4. (a) What types of stresses are induced in shafts ? Explain with the help of examples.
(b) Find the diameter of a solid steel shaft to transmit 20 kW at 200 rpm. The ultimate shear stress for the steel may be taken as 360 MPa and factor of safety as 7. 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 diameter is 0.5. 4+10
5. A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and the modulus of rigidity is 84 kN/mm^2 , find the axial load which the spring can carry and the deflection per active turn. 14
6. The lead screw of a lathe has a 50 mm Acme thread, one thread per cm. To drive the total carriage, this screw must exert an axial pressure of 3000 N. The thrust is carried on a collar 110 mm outside diameter and 55 mm inside diameter. The lead screw revolves at 3.14 rad/s. Determine
- (a) the efficiency of the screw and collar assuming a coefficient of friction of 0.15 for threads and 0.12 for collar, and
(b) the power required to drive the screw. 14

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

- (a) Concurrent Engineering
 - (b) Eccentric Loading in Riveted Joints
 - (c) Hydraulic Presses
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