B.Tech. – VIEP – MECHANICAL ENGINEERING (BTMEVI)
Term-End Examination
June, 2018

00633

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 Machine Design Data Handbook is permitted. Assume missing data suitably.*

1. (a) Explain the different types of riveted joints with neat sketches.　　7

   (b) Discuss the basic design requirements for machine elements.　　7

2. Determine the length of the weld run for a plate of size 120 mm wide and 15 mm thick to be welded to another plate by means of

   (a) a single transverse weld, and

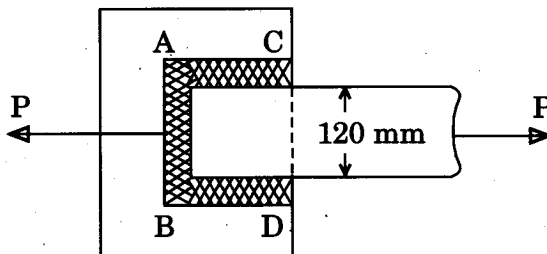   (b) double parallel fillet welds when the joint is subjected to variable loads.　　14

Figure 1

3. Design a cotter joint to connect a piston rod to the cross-head of a double acting steam engine. The diameter of the cylinder is 300 mm and the steam pressure is 1 N/mm^2. The allowable stresses for the material of cotter and piston rod are as follows : *14*

$\sigma_t = 500 \text{ MPa}$, $\tau = 400 \text{ MPa}$ and $\sigma_c = 84 \text{ MPa}$

4. 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*

5. A mild steel cover plate is to be designed for an inspection hole in the shell of a 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*

6. Two shafts, 100 mm diameter, are to be connected by means of two cast iron couplings. The allowable shearing stress of the shaft material is 55 N/mm^2. Find the size of the bolts to be used. Check the flange for the induced crushing stress. The allowable shearing stress of the bolt material is 45 N/mm^2. *14*

7. Explain any *two* of the following :   7+7

   (a)   Reverse engineering and its applications

   (b)   Stress concentration and its effects

   (c)   Pneumatic press and its design considerations

8. Write short notes on any *four* of the following : $4 \times 3\frac{1}{2} = 14$

   (a)   Concurrent Engineering

   (b)   Reliability

   (c)   Creep and Fatigue

   (d)   Helical Springs

   (e)   Cotter Joints

   (f)   Leaf Springs