G 1136 (Pages : 2) Reg. No.....

Name.....

# B.TECH. DEGREE EXAMINATION, MAY 2016

**Seventh Semester**

Branch : Mechanical Engineering

MACHINE DESIGN AND DRAWING–I (M)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

*Answer any* **four** *questions by selecting* **two** *from Part A and* **two** *from Part B.*

*Each question carries* 25 *marks.*

*Suitably assume any missing data.*



## Part A

1. The cylinder of an I.C.engine is subjected to a pressure of 68kN .It is held in position by means of 12 bolts. A soft copper gasket is used to make the joint leak proof. The effective diameter of cylinder is 300 mm. Find the size of the bolts so that stress in the bolts is not exceed 10 MPa.

2. Design a Knuckle Joint to Transmit 15000 N. The design stress may be taken as 750 $N/m^2$ in tension, 600 $N/m^2$ in shear and 1500 $N/m^2$ in compression.

3. Design and draw a cast iron flange coupling for a mild steel shaft transmitting 120 h.p. at 250 r.p.m. The allowable shear stress in the shaft is 39 MPa and the angle of twist is not exceed 1° in a length of 20 diameters. The allowable shear stress in the coupling is 29 MPa.

4. A double riveted, double strap but joint is to join 20 mm thick plates. The pitch of the rivets in the outer row is to be twice that of inner row. Zig-zag riveting is to be employed with the following working stress : $\tau$ = 63 Mpa and $\sigma$ = 84 MPa. Calculate rivet diameter, rivet pitches in the inner and outer rows and the thickness of the butt straps. Assume the rivets in double shear to be 1.875 times as strong as in single shear.

(2 × 25 = 50 marks)

**Turn over**

## Part B

5. A spring loaded safety valve for a boiler is required to blow off at a pressure of 1.5 N/mm$^2$ .the diameter of the valve is 60 mm. Design a suitable compression spring for the safety valve, assuming spring index to be 6 and 25 mm initial compression. The maximum lift of the valve is 15 mm, the shear stress in the spring material is to be limited to 450 MPa. Take G = 0.84 × 10$^5$ MPa.

6. A hollow steel shaft is to transmit 25 h.p. at 300 r.p.m. The loading is such that the maximum bending moment is 1000 kgf-cm, the maximum torsional moment is 5000 kgf-cm and axial compression load is 1500 kgf. The shaft is supported on rigid bearing 150 mm apart. The maximum permissible shear stress on the shaft is 400 kgf/cm$^2$. The inside diameter is 0.8 times the outside diameter. The load is cyclic in nature and applied with shocks. The values for the shock factors are $k_t$ = 1.5 and $k_m$ = 1.6.

7. A single cylinder engine delivers 185 kW at 100 r.p.m. The maximum fluctuation of energy per revolution is 15 % of the energy developed per revolution. The speed variations is limited to 1 % either away from the menu. The mean diameter of the rim is 2.4 m. Design and draw two views of the flywheel.

8. Determine the length of welds required to resist a load of 50 kN,between 12 mm thick plates, when the plates are joined by : (i) two parallel fillet welds ; (ii) two transverse fillet welds. Assume permissible tensile and shear as 90 MPa and 60 MPa respectively.

(2 × 25 = 50 marks)