

## Mechanical/Automobile

**QP Code : 6296**

### Revised Course

Duration: 3 Hrs

MAXIMUM MARKS : 80

- Question No. 1 is compulsory.
- Attempt any THREE questions from the remaining.
- Assumption made should be clearly stated.
- Use of PSG Design Data Book is permitted.

Q.1

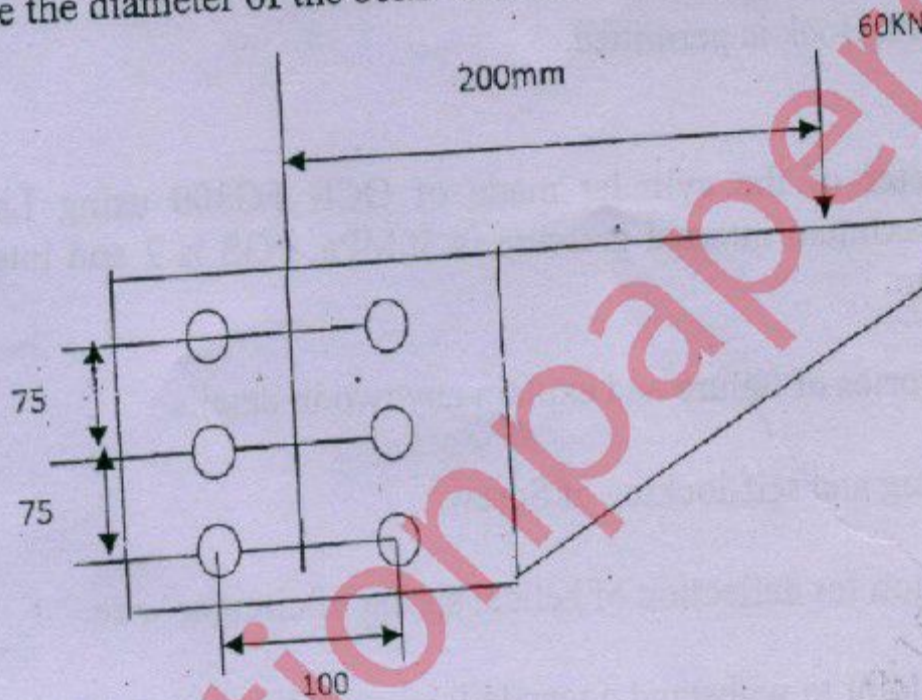
- (a) Find outer diameter of the cylinder made of GCI- FG300 using Lames equation if the maximum internal pressure is 30MPa, FOS is 2 and internal diameter is 250mm. 5
- (b) State different theories of failure and explain any two in details. 5
- (c) Explain overhauling and self-locking of Screw. 5
- (d) Derive an expression for deflection of helical spring of circular wire. 5

- Q.2 (a) Design a knuckle joint to withstand a tensile load of 25KN if the permissible stresses are 56MPa in tension, 40 MPa in shear and 70 MPa in compression. 15
- (b) Show that the efficiency of a self-locking screw is less than 50 percent. 5

- Q.3 (a) Determine the size of the circular bar using Soderberg equation with FOS=2.5 if it is subjected to tensile force varying 300KN to 550KN. It is made of carbon steel 35C8 with  $\sigma_{yt}=320\text{N/mm}^2$  and  $\sigma_{ul} = 600\text{N/mm}^2$ . 8
- (b) Select a standard hook of trapezoidal cross section to lift a load of 110KN and find the stress induced at critical cross section. 8
- (c) Explain different methods to reduce stress concentration. 4

- Q.4 (a) A steel shaft is supported at bearing A and B 750mm apart. A spur gear having PCD 400mm is located 150mm to the right of LH bearing and a pinion with PCD 120mm is mounted 350mm to the left of RH bearing. The gear is drive by the pinion located vertically below, while the pinion transmits power to another gear horizontally to the right. Using allowable shear stress 60MPa, determine the diameter of the shaft. The shaft transmitting 10 KW at 200 rpm. Shock and Fatigue factor in bending and torsion are 2.0 and 1.5 respectively. 16
- (b) Explain different types of keys with neat sketches 4

- Q.5 (a) Design a Clamp coupling for mild steel shaft transmitting 40 KW at 100 rpm. Coefficient of friction between the muff and the shaft surface is 0.3 and number of bolts connecting two halves are six. The allowable shear stress in the shaft and coupling bolts are 40 MPa and 70 MPa resp. 10
- (b) A Bracket is supported by means of 6 bolts of same size as shown. Determine the diameter of the bolts if the maximum shear stress is 150MPa. 10



- Q.6 (a) Explain manufacturing consideration in design. 6
- (b) Explain the terms : 6  
 1) Neeping of spring 2) Surge in spring
- (c) A laminated spring 500 mm long and 40 mm wide is held together at the centre by a band 85 mm wide. If the thickness of each leaf is 10 mm, find the number of leaves required to carry a load of 5400N. Assume maximum working stress of 280MPa. 8  
 If the two of the leaves extend the full length of the spring, find the deflection of the spring. The young modulus for the spring material is 210GPa.