17525

14115

4 Hours / 100 Marks   Seat No.

Instructions –   (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. a) **Attempt any <u>THREE</u> of the following:**   **12**

(i)   Define factor of safety. What factors affect its selection.

(ii) Define stress concentration and state its causes.

(iii) Draw a labelled sketch of a knuckle joint.

(iv) Describe design procedure of a rear axle.

b) **Attempt any <u>ONE</u> of the following:**   **06**

(i)   Derive the relation for torque to be transmitted by single plate clutch considering uniform wear condition.

(ii) Explain how a semi-elliptical leaf spring is designed.

Marks

2.   **Attempt any <u>FOUR</u> of the following:**   **16**

   a) Define the terms :

     (i) Fatigue and

     (ii) Endurance limit with suitable example.

   b) Mention applications of cotter joint, knuckle joint and turn buckle.

   c) State different types of levers with applications.

   d) Give in brief design procedure of a bell crank lever.

   e) Draw a neat sketch of piston showing thrust and non-thrust side.

3.   **Attempt any <u>FOUR</u> of the following:**   **16**

   a) A knuckle joint is required to withstand a tensile load of 25 kN. Design the joint if the permissible stresses are 56 N/mm^2, 40 N/mm^2 and 70 N/mm^2 in tension, shear and crushing respectively. (Any two failure)

   b) State various proportions of a rectangular sunk key with its neat sketch.

   c) Two mild steel rods of 40 mm diameter are to be connected by a cotter joint. The thickness of cotter is 12 mm. Calculate the dimensions of the socket, if the maximum allowable stresses are 46 N/mm^2 in tension, 35 N/mm^2 in shear and 70 N/mm^2 in crushing.

   d) Explain indicated power and brake power of an engine cylinder.

   e) Design the piston crown thickness from the following data-Diameter of piston = 80 mm. Maximum pressure on the piston = 4.5 N/mm^2 and allowable bending stress = 45 N/mm^2.

Marks

4. a) **Attempt any <u>THREE</u> of the following:**   **12**

        (i) Explain why nipping of leaf spring is necessary with neat sketch.

        (ii) Explain design of piston pin on the basis of bearing pressure and shear strength.

        (iii) Write four methods of failure in turn buckle's design.

        (iv) List different types of coupling and explain any one.

   b) **Attempt any <u>ONE</u> of the following:**   **06**

        (i) Explain ergonomic considerations in designing automobile components.

        (ii) Write stepwise design procedure for a bushed pin flexible coupling.

5. **Attempt any <u>TWO</u> of the following:**   **16**

   a) Explain following theories of failure.

        (i) Maximum principal stress theory

        (ii) Maximum shear stress theory

   b) A hollow propeller shaft of a car with outside diameter of 75 mm transmits 22.5 kW at 1500 rpm to the wheels which are 900 mm in diameter. If the allowable shear stress is 60 N/mm^2, find out the cross-section of shaft. Take gear box reduction 5.

   c) Write design calculations for piston rings.

Marks

6. Attempt any <u>TWO</u> of the following: **16**

  a) A single plate dry clutch transmits 7.5 kW at 900 rpm, the axial pressure is limited to 0.7 N/mm^2. If the co-efficient of friction is 0.25, find :

      (i) Mean radius and face width of friction lining assuming ratio of mean radius to face width as 4 and

      (ii) Outer and inner radii of the clutch plate.

  b) Explain design procedure of a connecting rod.

  c) An automotive gear box gives three forward and a reverse speed with top gear of unity and bottom and reverse gear ratio of 3.3:1, the center distance between shafts is 110 mm approximately. Gear teeth of module 3.25 mm are to be employed. Determine different gear ratios.

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