

22558

12223

3 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
- (2) Answer each next main Question on a new page.
- (3) Illustrate your answer with neat sketches wherever necessary.
- (4) Figures to the right indicate full marks.
- (5) Assume suitable data, if necessary.
- (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
- (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

- 1. Attempt any FIVE of the following: **10****
- a) Describe failure by fracture with suitable example.
 - b) Define service factor with their application.
 - c) State and justify material for clutch lining.
 - d) Describe the function of piston crown and piston ring.
 - e) Calculate stroke length and bore length if piston diameter is 120 mm.
 - f) Define :-
 - i) Ergonomics
 - ii) Aesthetic.
 - g) What is stress concentration? Write the causes of stress concentration.

P.T.O.

- 2. Attempt any THREE of the following:** **12**
- a) What points are taken into consideration for design of piston.
 - b) Design the skirt length of the piston with the following data of petrol engine. Maximum pressure inside the cylinder 5 N/mm^2 . Piston diameter 100 mm, side thrust is limited to 10% of maximum load on the piston. Allowable bearing pressure = 0.3 N/mm^2 .
 - c) A semi elliptical leaf spring sustains a load of 70 kN. The overall length of the spring is 1m consists of 18 leaves held together by 'U' bolts spaced 100 mm apart with overall depth to width ratio of 2. The allowable stress for spring material is 400 MPa. Take $E = 210 \text{ kN/mm}^2$.
 - d) Draw the following diagram and explain :-
 - i) Stress - strain diagram.
 - ii) S-N curve
- 3. Attempt any THREE of the following:** **12**
- a) Describe design procedure for front axle.
 - b) Describe design procedure for connecting rod.
 - c) Explain design procedure for piston ring.
 - d) Define standardization and state the advantage of it.
 - e) Explain maximum principal stress theory of failure.
- 4. Attempt any TWO of the following:** **12**
- a) Design diameter of fully floating rear axle if engine power is 80 kW at 5000 r.p.m. Gear box ratios are 4:1, 2.4:1, 1.5:1 and 1:1. The differential reduction is 5:1 allowable shear stress for shaft material is 65 N/mm^2 . Sketch the arrangement of the axle.
 - b) Calculate maximum, minimum and average pressure in a plate clutch if axial load is 4kN. The inside and outside radii of friction lining are 50 and 100 mm respectively.
 - c) List sequentially steps to design rocker arm.

5. Attempt any TWO of the following:**12**

- a) State functions and name of suitable material of the following:–
- i) Piston crown
 - ii) Piston rings
 - iii) Piston pin
- b) Describe the design procedure of rear axle.
- c) Explain consideration in automobile design.

6. Attempt any TWO of the following:**12**

- a) Find the minimum size of hole that can be punched in a 12mm thick plate having ultimate shear strength of 300 MPa and the maximum allowable compressive strength of punch material is 1200 MPa.
- b) Derive the relation for torque to be transmitted by single clutch, considering uniform wear.
- c) Design a propeller shaft to transmit 5 KW at 5000 rpm with gear box reduction 16:1. Assume shear stress = 45 N/mm².
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