

17525

**11920**

**4 Hours / 100 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 answers 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.

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| <b>1. (A) Attempt any THREE of the following :</b>  | <b>12</b>    |
| (i) Define factor of safety. What factors affect its selection ?                              | 4            |
| (ii) Draw and explain the stress-strain diagram for ductile material.                         | 4            |
| (iii) State four applications of knuckle joint.   | 4            |
| (iv) State the types of keys and their applications.  | 4            |
| <b>(B) Attempt any ONE of the following :</b>   | <b>6</b>     |
| (i) Explain Ergonomic aspects and Aesthetics in designing automobile with their applications. | 6            |
| (ii) Explain Maximum principal stress theory of failure.                                      | 6            |

- 2. Attempt any FOUR of the following : 16**
- (a) Explain design consideration in Automobile design. 4
  - (b) Write any four strength equations in design of socket and spigot cotter joint with relevant sketches. 4
  - (c) Explain design procedure of turn buckle. 4
  - (d) A knuckle joint is to withstand a load of 30 kN. Design the joint, if permissible stresses are,  $\sigma_t = 56 \text{ N/mm}^2$ ,  $\tau = 35 \text{ N/mm}^2$  and  $\sigma_{ck} = 70 \text{ N/mm}^2$ , assume suitable data. 4
  - (e) Describe the design procedure of a rear axle. 4
- 3. Attempt any FOUR of the following : 16**
- (a) Write stepwise design procedure for a bushed pin flexible coupling. 4
  - (b) Design a propeller shaft to transmit 5 kW at 5000 rpm with gear box reduction 16 : 1. Assume permissible shear stress for shaft material is  $45 \text{ N/mm}^2$ . 4
  - (c) State and explain the effect of keyways on shaft. 4
  - (d) State the concept of whirling and critical speed of the shaft. 4
  - (e) Write stepwise design procedure for sunk key. 4
- 4. (A) Attempt any THREE of the following : 12**
- (i) Define a lever. Describe three basic types of lever. 4
  - (ii) Explain design procedure of rocker arm. 4

- (iii) Explain design procedure of bell crank lever. 4
- (iv) Write factors to be consider while selecting material for piston or connecting rod or cylinder head. 4
- (B) Attempt any ONE of the following :** 6
- (i) Explain Bolts of uniform strength with sketch. 6
- (ii) Explain design procedure of semi-elliptical leaf spring. 6
- 5. Attempt any TWO of the following :** 16
- (a) Draw the neat sketch of sliding mesh gear box and write the design procedure for teeth calculation. 8
- (b) Derive the relation for torque to be transmitted by single plate clutch considering uniform wear condition and uniform pressure condition. 8
- (c) Write design procedure for connecting rod. 8
- 6. Attempt any TWO of the following :** 16
- (a) Describe in detail design procedure to design
- (i) Thickness of cylinder head.
- (ii) Cylinder head bolts or studs. 8

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- (b) Design the piston pin with following data :

Maximum pressure on the piston is  $4 \text{ N/mm}^2$ , diameter of piston 70 mm, Allowable stresses, due to bearing is  $30 \text{ N/mm}^2$ , bending  $80 \text{ N/mm}^2$ , and shear stress  $60 \text{ N/mm}^2$ . Assume suitable data.

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- (c) (i) Estimate length of piston

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- (ii) Draw thrust and non-thrust sides of I.C. Engine piston.

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