

22484

24225

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 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.

Marks

1. Attempt any FIVE of the following :

10

- (a) Define :
 - (i) Kinematic link
 - (ii) Kinematic pair
- (b) List any four applications of 'cam' and 'follower'.
- (c) State any two advantages of V-belt drive over flat belt drive.
- (d) Define factor of safety for ductile and brittle material.
- (e) Draw stress-strain diagram for ductile material.
- (f) State function of key.
- (g) Give the classification of springs.



2. Attempt any THREE of the following :**12**

- (a) Explain the working of scotch yoke mechanism with neat sketch.
- (b) Draw a neat sketch of Oldham coupling and label the following parts :
 - (i) Shaft
 - (ii) Flanges
 - (iii) Bearing
 - (iv) Centre block
- (c) Draw the following displacement diagram for follower :
 - (i) S.H.M.
 - (ii) Uniform acceleration and deceleration
- (d) Find the power transmitted by a belt running over a pulley of 600 mm diameter at 200 rpm. The co-efficient of friction between the belt and pulley is 0.25, angle of lap is 165° , and maximum tension in the belt is 2550 N.

3. Attempt any THREE of the following :**12**

- (a) Compare Belt Drive and Chain Drive (four points).
- (b) Explain compound gear train with neat sketch.
- (c) Explain general considerations in design.
- (d) State the following material specifications :
 - (i) FeF230
 - (ii) FG200
 - (iii) 35C8
 - (iv) 10C8510

4. Attempt any THREE of the following :**12**

- (a) An I.C. Engine developing 10 kW of power is to be transmitted to a machine by flat leather belt. A 0.8 m diameter pulley is fitted on engine shaft and rotates at 300 rpm. The angle of lap is 175° and coefficient of friction in belt and pulley is 0.25. Determine tension in the belt.

- (b) Suggest suitable material for the following machine parts :
 - (i) Helical spring
 - (ii) Turbine blade
 - (iii) Lathe bed
 - (iv) Bushes for knuckle pin
- (c) Write the design procedure of knuckle joint.
- (d) Explain selection of ball bearings using manufacturer's catalogue.
- (e) Define the following terms with respect to spring :
 - (i) Free length
 - (ii) Solid length
 - (iii) Spring index
 - (iv) Spring rate

5. Attempt any TWO of the following :

12

- (a) Explain construction and working of crank and slotted lever quick return mechanism with neat sketch.
- (b) A cam operates a roller follower, axis passing through the axis of cam. The specification are :
 - (i) Minimum radius of cam = 25 mm
 - (ii) Lift of follower = 30 mm
 - (iii) Diameter of roller = 15 mm
 - (iv) Angle of lift = 120° with SHM
 - (v) Outer dwell angle = 30°
 - (vi) Angle of return = 150° with uniform acceleration & retardation.
- (c) Explain the design procedure of flanged coupling with neat sketch.

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

- (a) A shaft is required to transmit 1 MW power at 240 rpm. The shaft must not twist more than 1° on a length of one meter. If the modulus of rigidity for the material of the shaft is 80 kN/mm^2 , find diameter of shaft and shear stress induced in it.
 - (b) Write down the design procedure of cotter joint with neat sketches.
 - (c) A closely coiled helical spring is made of 10 mm diameter steel wire. The coil consists of 10 complete turns with a mean diameter of 120 mm. The spring carries an axial pull of 200 N. Determine the shear stress induced in the spring neglecting the effect of stress concentration. Determine also the deflection of the spring, its stiffness & strain energy stored by it if the modulus of rigidity of the spring material is 80 kN/mm^2 .
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