

# 22370

**12425**

**3 Hours / 70 Marks**

Seat No. 

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- Instructions* – (1) All Questions are *Compulsory*.  
(2) Illustrate your answers with neat sketches wherever necessary.  
(3) Figures to the right indicate full marks.  
(4) Assume suitable data, if necessary.  
(5) Use of Non-programmable Electronic Pocket Calculator is permissible.  
(6) 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) State any two types of motion of the follower.
  - c) State four advantages of chain drive over belt drive.
  - d) Define fluctuation of energy and coefficient of fluctuation of energy.
  - e) State the inversions of single slider crank chain.
  - f) State law of gearing.
  - g) State any two advantages of roller follower over knife edge follower.

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- 2. Attempt any THREE of the following :** **12**
- a) Give the detail classification of engineering material.
  - b) State four properties and four Application of Acrylics.
  - c) Define Gear train. Draw a neat sketch of 'Epicyclic gear train.'
  - d) Explain turning moment diagram of a four stroke cycle of internal combustion engine with neat sketch.
- 3. Attempt any THREE of the following :** **12**
- a) List different types of kinematic pair. Describe any one.
  - b) State the properties and application of smart material.
  - c) Define composite material. Give two examples.
  - d) Give detailed classification of follower.
  - e) Explain with neat sketch compound gear train.
- 4. Attempt any THREE of the following :** **12**
- a) Differentiate between White cast iron and Grey cast iron.
  - b) State the types of ceramics and list the applications of refractories.
  - c) Sketch and explain the working of Rotary Engine.
  - d) Draw a neat sketch of Radial cam with roller follower and show on it.
    - i) Base circle
    - ii) Pitch point
    - iii) Prime circle
    - iv) Cam profile
  - e) State the function of a flywheel and explain how it differs from that of a governor.

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

- a) A cam is to be designed for a roller follower with the following data.
- i) Valve lift/open = 37.5 mm during  $60^\circ$  of cam rotation with uniform acceleration and retardation.
  - ii) Valve remains open for the next  $20^\circ$ .
  - iii) During the next  $60^\circ$  of cam rotation, the valve returns to its original position with uniform acceleration and retardation.
  - iv) Valve remains close during the remaining cam rotation. Draw the profile of the cam when, the line of stroke of the follower passes through the axis of the cam shaft, the radius of the base circle of the cam is 40 mm and roller radius is 20 mm.
- b) Explain with neat sketch working of crank and slotted lever quick return mechanism.
- c) Explain with neat sketch simple gear train. Also obtain the velocity ratio.

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

- a) Draw neat sketch of Iron-carbon equilibrium diagram and show important temperature and phases on it.
- b) In a flat belt drive the Initial tension is 2000 N. The coefficient of friction between the belt and the pulley is 0.3 and the angle of lap on the smaller pulley is  $150^\circ$ . The smaller pulley has a radius of 200 mm and rotates at 500 rpm. Find the power in KW transmitted by belt.
- c) The weights of four masses  $m_1$ ,  $m_2$ ,  $m_3$  and  $m_4$  are 250 kg, 350 kg, 290 kg and 310 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angle between successive masses are  $45^\circ$ ,  $75^\circ$  and  $135^\circ$ . Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m.
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