

# 22438

**12526**

**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) List the four inversions of four bar chain.
  - b) Define Kinematic pair with one example.
  - c) Define Linear and Angular velocity.
  - d) State four applications of cam and followers.
  - e) Define :–
    - i) Base circle
    - ii) Lift of followers.
  - f) List any four types of brakes.
  - g) State the function of flywheel in internal combustion engine.

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2. Attempt any THREE of the following: 12
- a) Differentiate between machine and mechanism.
  - b) Compare belt drive and chain drive.
  - c) Draw the displacement diagrams for a follower when it moves with :-
    - i) Uniform velocity
    - ii) Simple harmonic motion.
  - d) Explain the construction of compound gear train using suitable sketch.
3. Attempt any THREE of the following: 12
- a) Explain crank and slotted lever mechanism using suitable sketch.
  - b) Differentiate between completely constrained and successfully constrained motion with suitable sketch.
  - c) Draw and explain internal expanding shoe brake.
  - d) Draw different types of followers.
  - e) Draw turning moment diagram for 4-stroke internal combustion petrol engine.
4. Attempt any TWO of the following: 12
- a) Explain with neat sketch Elliptical trammel mechanism.
  - b) In a reciprocating engine, crank is 250 mm long and connecting rod is 1000 mm long. The crank rotates at 150 rpm. Find the velocity and acceleration of Piston and angular velocity and angular acceleration of connecting rod, when crank makes an angle of  $30^\circ$  to Inner dead centre (IDC). Use analytical method.
  - c) A cam is to be designed for knife edge follower with following data. Cam lift 40 mm during  $90^\circ$  of cam rotation with simple harmonic motion dwell for next  $30^\circ$ , during return stroke  $60^\circ$  of cam rotation again with simple harmonic motion. Minimum radius of cam is 25 mm. Draw cam profile when the line of motion of follower passes through the axis of cam and cam rotates in clockwise direction.

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

- a) Two pulley's one 450 mm diameter and the other 200 mm diameter are on parallel shaft is 1.95 m apart and are connected by cross belt drive. Find the length of belt required and the angle of contact between belt and each pulley.

What power can be transmitted by belt when larger pulley rotates at 200 rpm; if maximum permissible tension in the belt is 1000 N and  $\mu = 0.25$ .

- b) Explain Klein's construction to determine velocity and acceleration of different links in single slider crank mechanism.
- c) Draw neat sketch of centrifugal governor and explain it's working.

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

- a) Explain the construction of Epicyclic gear train with neat sketch.
- b) Draw neat sketch of single plate clutch and explain it's working.
- c) Four masses  $M_1$ ,  $M_2$ ,  $M_3$ ,  $M_4$  are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are  $45^\circ$ ,  $75^\circ$  and  $135^\circ$ . Find the position and magnitude of balance mass required. If it's radius of rotation is 0.2 m.

[Use graphical method.]

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