21718

3 Hours / 100 Marks Seat No. | | | | | | | | |

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. (A) Attempt any SIX of the following : **12**

(a) Enlist inversions of single slider crank mechanism.

(b) State law of Gearing.

(c) Define :

(i) Co-efficient of fluctuation of energy.

(ii) Co-efficient of fluctuation of speed.

(d) Give functions of Brakes.

(e) Why balancing is necessary for high speed ?

(f) Define :

(i) Kinematic Link

(ii) Kinematic Chain

(g) Define : Relative velocity and Relative acceleration.

(h) Enlist various follower motions.

(B) Attempt any TWO of the following : **8**

(a) Define constrained motion and explain its types with neat sketch.

(b) State function and working principle of clutch.

(c) Compare open belt and cross belt drive on the basis of

(i) Velocity Ratio, (ii) Application, (iii) Direction of Driven Pulley, (iv) Length of Belt

2. Attempt any FOUR of the following : **16**

(a) With neat sketch explain pantograph.

(b) Explain Klein's construction to determine velocity and acceleration of link in an IC engine.

(c) Compare Flywheel and Governor.

(d) List the differences between Braker and Dynamometers.

(e) Explain slip and creep in Belt Drive.

(f) Define Gear Train. Also state types of Gear train.

3. Attempt any FOUR of the following : **16**

(a) Draw neat sketch of centrifugal Governor.

(b) Draw only a neat labelled sketch of elliptical trammel and label it.

(c) Define Angular acceleration and give inter-relation between linear and angular velocity and acceleration.

(d) Explain with neat sketch working of a single plate clutch.

(e) In a four bar mechanism, crank AB rotates at 36 rad/sec. The lengths of a link are AB = 200 mm, BC = 400 mm, CD = 450 mm and AD = 600 mm. AD is the fixed link. At the instant when AB is at right angles to AD, determine velocity of the mid-point of link BC.

(f) (i) Define Angle of Lap. **2**

(ii) State applications of Cams and followers. **2**

4. Attempt any FOUR of the following : **16**

(a) Explain Whit Worth Quick Return Mechanism.

(b) 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 the pulley is 0.25, angle of lap is 160º and maximum tension in the belt is 2500 N.

(c) Draw a neat sketch of Radial cam with roller follower and show on it :

(i) Base circle, (ii) Pitch circle, (iii) Trace point, (iv) Pressure Angle

(d) Four masses m_1, m_2, m_3 and m_4 are 100 kg, 160 kg, 300 kg and 200 kg respectively. The corresponding radii are 300 mm, 250 mm, 150 mm and 200 mm respectively. The angle between successive masses is 45º, 90º, 135º. Find the position and magnitude of balancing mass required, if radius of rotation is to be 200 mm. Solve the problem by graphical method only.

(e) Compare flat belt and V belt.

(f) State advantages of roller follower over knife edge follower.

5. Attempt any FOUR of the following : **16**

(a) Explain function of flywheel with turning moment diagram for single slider 4 stroke IC engine.

(b) Describe with neat sketch working of Oldham's coupling.

(c) State advantages and disadvantages of Chain drive over belt drive.

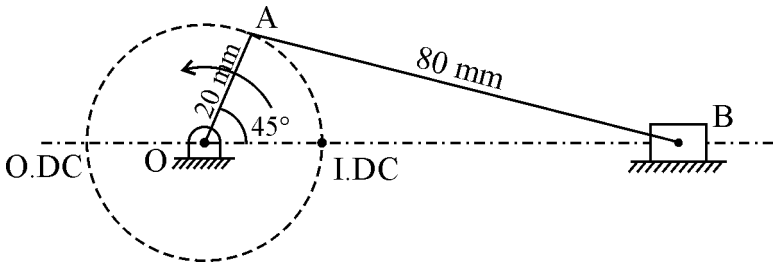
(d) Explain construction and working of Eddy current Dynamometer.

(e) A simple band brake is operated by a lever 40 cm long. Brake drum diameter is 40 cm and brake band embraces 225º of its circumference. One end of band is attached to the fulcrum, while the other end is attached to a pin, 8 cm from fulcrum. The co-efficient of friction is 0.3. The effort applied at the end of lever is 400 N. Find braking torque applied, if it rotates anti-clockwise, when effort is applied upwards.

(f) Draw neat sketch of Internal Expanding Shoe Brake.

6. Attempt any TWO of the following : **16**

(a) Determine (i) The velocity and acceleration of piston, (ii) angular velocity of connecting rod, (iii) angular acceleration of connecting rod of the configuration shown below using graphical method, when crank OA rotates with uniform speed of 200 rad/sec.



(b) A shaft has number of collars integral with it. External diameter of collar is 400 mm and shaft diameter is 250 mm. If the intensity of pressure is 0.35 N/mm^2 (uniform) and co-efficient of friction is 0.05, estimate (i) power absorbed when the shaft runs at 105 rpm carrying a load of 150 kN (ii) Number of collars required.

(c) Draw the profile of cam operating a knife edged follower having a lift of 30 mm. The cam raises the follower with S.H.M. for 150º of its rotation followed by a period of dwell for 60º. The follower descends for the next 100º rotation of one cam with uniform velocity again followed by a dwell period. The cam rotates at a uniform velocity of 120 rpm and has least radius of 20 mm.
