

17412

15162

3 Hours / 100 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. | (A) Attempt any SIX : | 12 |
| | (a) Enlist the types of constrained motion. Draw a label sketch of any one. | |
| | (b) Define (i) Pressure angle (ii) pitch point related to cam. | |
| | (c) How are drives classified ? | |
| | (d) Write any two disadvantages of chain drive. | |
| | (e) Define (i) coefficient of fluctuation of speed
(ii) coefficient of fluctuation of energy. | |
| | (f) Draw a line diagram of porter governor. | |
| | (g) State the application of (i) Disc brake (ii) Internal expanding brake. | |
| | (h) Why is balancing of rotating parts necessary for high speed engines ? | |
| | (B) Attempt any TWO : | 08 |
| | (a) State inversion of double slider crank chain. Explain Oldham's coupling with neat sketch. | |
| | (b) Explain (i) uniform pressure theory
(ii) uniform wear theory in clutches and bearings. | |
| | (c) Compare cross belt drive and open belt drive on the basis of : | |
| | (i) velocity ratio (ii) direction of driven pulley (iii) length of belt drive | |
| | (iv) Application | |

P.T.O.

2. Attempt any FOUR :**16**

- (a) Draw a labelled sketch of Quick return mechanism of shaper and explain its working.
- (b) What are the types of kinematic pair ? Give its examples.
- (c) Define linear velocity, angular velocity, absolute velocity and state the relation between linear velocity and angular velocity.
- (d) Explain the Klein's construction to determine velocity and acceleration of single slider crank mechanism.
- (e) 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
- (f) A shaft runs at 80 rpm & drives another shaft at 150 rpm through belt drive. The diameter of the driving pulley is 600 mm. Determine the diameter of the driven pulley in the following cases :
 - (i) Taking belt thickness as 5 mm
 - (ii) Assuming for belt thickness 5 mm and total slip of 4%.

3. Attempt any FOUR :**16**

- (a) In a slider-crank mechanism, the crank is 480 mm long and rotates at 20 rad/sec in the counter-clockwise direction. The length of the connecting rod is 1600 mm. when the crank turns 60° from the inner-dead centre. Determine the velocity of the slider by relative velocity method.
- (b) In a slider crank mechanism, crank $AB = 20$ mm & connecting rod $BC = 80$ mm. Crank AB rotates with uniform speed of 1000 rpm in anticlockwise direction. Find
 - (i) Angular velocity of connecting rod BC
 - (ii) Velocity of slider C .When crank AB makes an angle of 60 degrees with the horizontal. Draw the configuration diagram also. Use analytical method.
- (c) Explain epicyclic gear train with neat sketch.
- (d) Draw a labelled sketch of multiplate clutch and state its applications.
- (e) Write the procedure of balancing single rotating mass when it balance mass is rotating in the same plane as that of disturbing mass.
- (f) What are the different types of follower motion ? Also draw displacement diagram for uniform velocity.

4. Attempt any FOUR :

16

- (a) State and explain Law of Gearing.
- (b) Justify with neat sketch elliptical trammel as an inversion of double slider crank chain.
- (c) Differentiate between flywheel and governor.
- (d) Explain construction and working of eddy current dynamometer.
- (e) A multiplate disc clutch transmits 55 kW of power at 1800 rpm. Coefficient of friction for the friction surfaces is 0.1. Axial intensity of pressure is not to exceed 160 kN/m^2 . The internal radius is 80 mm and is 0.7 times the external radius. Find the number of plates needed to transmit the required torque.
- (f) A rotor having the following properties :

$$m_1 = 4 \text{ kg} \quad r_1 = 75 \text{ mm} \quad \theta_1 = 45^\circ$$

$$m_2 = 3 \text{ kg} \quad r_2 = 85 \text{ mm} \quad \theta_2 = 135^\circ$$

$$m_3 = 2.5 \text{ kg} \quad r_3 = 50 \text{ mm} \quad \theta_3 = 240^\circ$$

Determine the amount of the counter mass at a radial distance of 75 mm required for the static balance.

5. Attempt any TWO :

16

- (a) In a slider crank mechanism shown in figure 1.

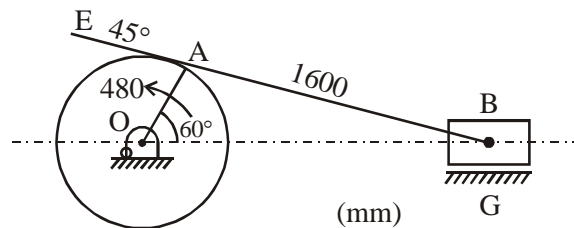


Fig. - 1

Calculate :

- (i) The acceleration of the slider at B
- (ii) The acceleration of point E.
- (iii) The acceleration of link AB. OA rotates at 20 rad/sec counter – clockwise.
- (b) Draw the profile of cam operating a roller reciprocating follower with the following data :

$$\text{Minimum radius of cam} = 25 \text{ mm}$$

lift = 30 mm
 Roller diameter = 15 mm

The cam lifts the follower for 120° with SHM followed by a dwell period of 30° . Then the follower lowers down during 150° of the cam rotation with uniform acceleration and deceleration followed by a dwell period.

- (c) Two parallel shafts, connected by a crossed belt, are provided with pulleys 480 mm and 640 mm in diameters. The distance between the centre lines of the shafts is 3 m. Find by how much the length of the belt should be changed if it is desired to alter the direction of rotation of the driven shaft.

6. Attempt any TWO :

16

- (a) (i) Explain steep and creep phenomenon in belts.
 (ii) Explain single cylinder 4-stroke I.C. engine using turning moment diagram.
- (b) A simple band brake shown in figure 2 is applied to a shaft carrying a flywheel of mass 250 kg and of radius of gyration 300 mm. The shaft speed is 200 rpm. The drum diameter is 200 mm and the coefficient of friction is 0.25. The dimensions a and l are 100 mm and 280 mm respectively and the angle $\beta = 135^\circ$. Determine
- (i) the brake torque when a force of 120 N is applied at the lever end.
 (ii) the number of turns of the flywheel before it comes to rest.
 (iii) the time taken by flywheel to come to rest.

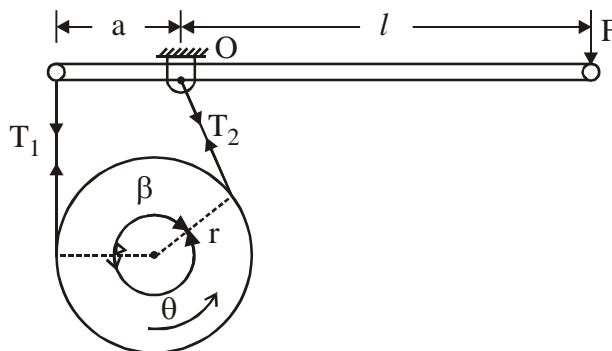


Fig. – 2

- (c) A conical pivot with angle of cone as 100° , supports a load of 18 kN. The external radius is 2.5 times the internal radius. The shaft rotates at 150 rpm. If the intensity of pressure is to be 300 kN/m^2 and coefficient of friction as 0.05, what is the power lost in working against the friction ?