11718

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 : **12**

(a) Define kinematic link and kinematic chain.

(b) State types of cams.

(c) State law of gearing.

(d) State the types of chains & sprockets.

(e) State the function of flywheel in I.C. Engine.

(f) State the function of governor.

(g) Compare brakes and dynamometers. (any two points)

(h) Why is balancing of rotating parts necessary for high speed engines ?

(B) Attempt any TWO : **8**

(a) Define completely constrained motion and successfully constrained motion with neat sketch. State one example of each.

(b) State function of clutch. Explain working principle of clutch.

(c) State one application of each : v-belt drive, flat belt drive, chain drive and gear drive.

2. Attempt any FOUR: **16**

(a) Differentiate between machine and structure.

(b) Explain with the neat sketch working of crank and slotted lever quick return mechanism.

(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 the labelled displacement, velocity and acceleration diagrams for a follower when it moves with uniform velocity.

(f) A flat belt drive is required to transmit 35 kW from a pulley of 1.5 m effective diameter running at speed of 300 rpm. The angle of contact is spread over 11/24 of the circumference co-efficient of friction for the surface is 0.3. Determine the maximum tension in the belt.

3. Attempt any FOUR: **16**

(a) In a four bar chain ABCD, AD is fixed and is 150 mm long. The crank AB is 40 mm long and rotates at 120 r.p.m. clockwise, while the link CD = 80 mm oscillates about D. BC and AB are of equal length. Find the angular velocity of link CD when angle BAD = 60°.

(b) In a slider crank mechanism, the length of crank OB and connecting rod AB are 125 mm and 500 mm respectively. The centre of gravity G of the connecting rod is 275 mm from the slider. The crank speed is 600 rpm clockwise. When the crank has turned 45° from the inner dead centre position, determine :

(i) Velocity of slider 'A',

(ii) Velocity of the point 'G' graphically.

(c) Explain slip and creep phenomenon in belts.

(d) Draw the neat sketch of diaphragm clutch and explain its working.

(e) Write the procedure for balancing of a single rotating mass by single masses rotating in the same plane.

(f) Give detailed classification of followers.

4. Attempt any FOUR: **16**

(a) State advantages and disadvantages of chain drive over belt drive.

(b) Justify that slider crank mechanism is a modification of the basic four bar mechanism with neat sketch.

(c) Compare flywheel and governor.

(d) Explain with neat sketch construction and working of eddy current dynamometer.

(e) A flat foot step bearing 225 mm in diameter supports a load of 7500 N. If the co-efficient of friction is 0.09 and the shaft rotates at 600 rpm, calculate the power lost in friction.

(f) Four masses attached to a shaft and their respective radii of rotation are given as :

$m_1 = 180$ kg $m_2 = 300$ kg $m_3 = 230$ kg $m_4 = 260$ kg

$r_1 = 0.2$ m $r_2 = 0.15$ m $r_3 = 0.25$ m $r_4 = 0.3$ m

The angles between successive masses are 45°, 75° and 135°. Find the position and magnitude of the balance mass required, it its radius of rotation is 0.2 m. The masses revolve in same plane.

5. Attempt any TWO : **16**

(a) The crank of a slider crank mechanism rotates clockwise at a constant speed of 300 rpm. The crank is 150 mm and the connecting rod is 600 mm long. Determine :

(i) linear velocity and acceleration of the mid-point of the connecting rod, and

(ii) angular velocity and angular acceleration of the connecting rod, at a crank angle of 45° from inner dead centre position.

(b) Draw the profile of a cam to raise a valve with S.H.M. through 40 mm in $\frac{1}{4}^{th}$ of revolution, keep it fully raised through 1/10 th revolution and to lower it with uniform acceleration and retardation in 1/6th revolution. The valve remains closed during the rest of the revolution. The diameter of roller is 20 mm and minimum radius of cam to be 30 mm. The axis of the valve rod passes through the axis of cam shaft.

(c) Two pulley, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley.

What power can be transmitted by the belt when the larger pulley rotates at 200 rpm, if the maximum permissible tension in the belt is 1 kN and the co-efficient of friction between the belt and pulley is 0.25 ?

6. Attempt any TWO : **16**

(a) (i) State types of gear train and explain any one.

(ii) Draw turning moment diagram for single cylinder four stroke I.C. Engine.

(b) A simple band brake is operated by lever 40 cm long. The brake drum diameter is 40 cm and brake band embrance 5/8 of its circumference. One end of band is attached to a fulcrum of lever while other end attached to pin 8 cm from fulcrum. The co-efficient of friction is 0.25. The effort applied at the end of lever is 500 N. Find braking torque applied if drum rotates anti-clockwise and acts downwards.

(c) A single plate clutch, effective on both sides, is required to transmit 25 kW at 3000 rpm. Determine the outer and inner radii of frictional surface, if the co-efficient of friction is 0.255 the ratio of radii is 1.25 and the maximum pressure is not to exceed 0.1 N/mm^2. Also determine the axial thrust to be provided by springs. Assume the theory of uniform wear.
