17412

16117

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

Instructions – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers 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. a) **Attempt any SIX of the following:** **12**

(i) Define Kinematic link with one example.

(ii) Name different mechanisms generated from a single slider crank chain.

(iii) State the advantages of roller follower over knife edge follower.

(iv) Define slip and creep in case of belt drive.

(v) Give four advantages of chain drive over belt drive.

(vi) State the effect of centrifugal tension on power transmission.

(vii) Define fluctuation of energy and coefficient of fluctuation of energy.

(viii) State the adverse effect of imbalance of rotating elements of machine.

Marks

b) **Attempt any TWO of the following:** **8**

(i) State any four inversions of single slider crane chain. Describe any one with neat sketch.

(ii) Compare multiplate clutch with cone clutch on the following basis.

(1) Power Transmission

(2) Size

(iii) The central distance two shaft is 4 m having two pulleys with diameter having 500 mm and 700 mm respectively find the length of belt required -

(1) for open belt drive

(2) for cross belt drive

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

a) Explain a scotch yoke mechanism with a neat sketch.

b) What is machine ? Differentiate between a machine and a structure.

c) Explain Klein's construction to determine velocity and acceleration of different links in single slider crank mechanism.

d) Define the terms:

(i) Linear velocity

(ii) Angular velocity

(iii) Absolute velocity

(iv) Relative velocity.

e) Explain with neat sketch different types of follower.

f) A pulley is driven by the flat belt running at speed of 600 m/min. and transmit 4 kW. The coefficient of friction between belt and pulley is 0.3 and angle of lap is 160°. Find maximum tension in the belt.

Marks

3. Attempt any FOUR of the following: 16

a) Discuss the following motion of the follower by drawing the displacement velocity and acceleration diagram.

(i) Uniform Velocity

(ii) Simple Harmonic Motion

(iii) Uniform acceleration and retardation

b) The crank and connecting rod of steam engine are 0.5 m and 2 m long respectively. The crank makes 180 r.p.m. in clockwise direction. When it has turned through 45° from I.D.C. Find the velocity of piston and angular velocity of connecting rod by relative velocity method.

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

(i) Velocity ratio

(ii) Direction of driven pulley

(iii) Application

(iv) Length of belt drive

d) State the applications of :

(i) Band brake

(ii) Disc brake

(iii) Internal expanding shoe brake

(iv) External shoe brake

e) Three masses 10 kg, 20 kg and 15 kg are attached at a point at radii of 20 cm, 25 cm and 15 cm respectively. If the angle between successive masses is 60° and 90°. Determine analytically the balancing mass to be attached at radius of 30 cm.

f) Explain with neat sketch working principle of epicyclic gear train.

Marks

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

a) Generally, the lower side is kept "Tight side" and upper side is kept as "Slack side" with the belt drives having small driving pulley and big driven pulley. Why ?

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

c) Distinguish between flywheel and governor.

d) Discuss the working of Rope brake dynamometer with the help of a neat sketch.

e) Explain the working of internal expanding shoe brake with the help of neat sketch.

f) Explain the process of balancing of single rotating mass by a single mass rotating in the same plane.

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

a) In a slider crank mechanism the length of crank and connecting rod are 100 mm and 40 mm respectively. The crank rotates uniformly at 600 rpm clockwise. Then crank has turned through 45° from I.D.C. Find by analytical method.

(i) Velocity and acceleration of slider

(ii) Angular velocity and angular acceleration of connecting rod.

b) Draw profile of cam to raise the valve with S.H.M. through 5 cm in 120° of revolution, keep it fully raised through 30° and lower it with equal uniform acceleration and retardation through 90° of rotation. The valve remain closed during the rest of rotation. The diameter of the roller is 2 cm and the minimum radius of the cam is 5 cm. The axis of the valve rod is offset 2 cm from the axis of the shaft. Assume the cam rotating in clockwise direction.

Marks

c) In a band and block brake shown in Fig. No. 1 has 14 blocks. Each block subtends an angle of 16°, and $\mu = 0.3$. Tension on tight side is T_1 and that on slack side is T_2 when force of 300 N is applied at the end of lever, find braking torque and direction of rotation of drum required.

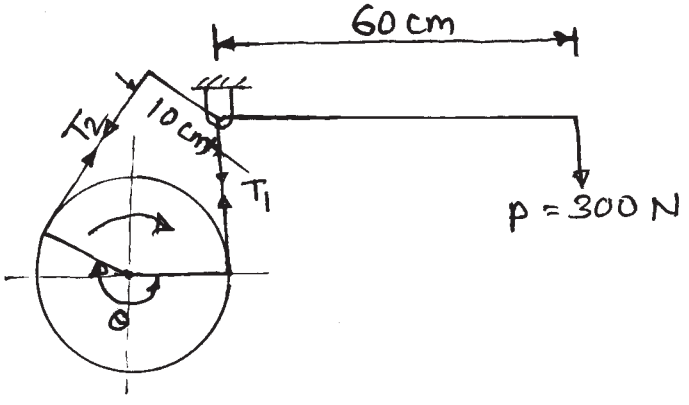

Fig. No. 1

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

a) (i) Define the following terms as applied to cam with neat sketch.

(1) Pitch circle

(2) Pressure angle

(3) Stroke of follower

(4) Module

(ii) Differentiate between disc brake and internally expanding brake.

b) PQRS is a four bar chain with link PS fixed. The lengths of links are PQ = 62.5 mm, QR = 175 mm, RS = 112.5 mm and PS = 200 mm, The crank PQ rotates at 10 rad/sec clockwise. Draw velocity and acceleration diagram, when angle QPS = 60° and Q and R lie on the same side of PS. Find the angular velocity and angular acceleration of links QR and RS.

Marks

c) Determine the power lost in a footstep bearing due to friction if a load of 15 kN is supported and the shaft is rotating at 100 r.p.m. The diameter of bearing is 15 cm and coefficient of friction is 0.05.

Assume :

(i) Uniform wear condition

(ii) Uniform pressure condition.

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