Q.P. Code: 22666

(3 Hours)   **Total Marks: 80**

N.B. 1) Question No.1 is compulsory.
    2) Attempt any three questions out of the remaining five questions.
    3) Figures to the right indicate full marks.
    4) Assume suitable data wherever required but justify the same.

Q1.   **Attempt any four**   **(20)**

  A. What are the advantages and disadvantages of chain drive over belt drive?

  B. Differentiate between cycloidal and involute teeth gear.

  C. What are the different types of instantaneous centers?

  D. Classify Cams in detail.

  E. State and explain Work – Energy principle and conservation of energy.

Q2 A. Two pulleys, one 450 mm diameter and the other 200 mm diameter are on   **(10)**
parallel shafts 1.95 m apart and are connected by cross 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 1×10^3 N and the coefficient of
friction between the belt and the pulley is 0.25?

  B. Two mating gears have 20 and 40 involute teeth of module 10 mm and 20^0 **(10)**
pressure angle. If addendum on each wheel is such that path of contact is
maximum and interference is just avoided, find the path of contact, arc of contact
and contact ratio. Also find the addendum for each wheel.

Q3 A. A cam rotating at 150 rpm operates a reciprocating roller follower of radius 2.5   **(10)**
cm. The least radius of the cam is 5 cm and the stroke of the follower is 5 cm.
Ascent and descent both takes place by uniform acceleration and retardation.
Ascent takes place during 75^0 and descent during 90^0 of cam rotation. Dwell
between ascent and descent is 60^0. Sketch displacement, velocity and
acceleration diagrams and mark salient features.

  B. Derive an expression for the ratio of shaft velocities for Hooke's joint and draw the polar   **(10)**
diagram depicting the salient features of driven shaft speed.

Q4 A. The reduction of speed from 360 rpm to 120 rpm is desired by the use of chain   **(10)**
drive. The driving sprocket has 10 teeth. Find the number of teeth on the driven
sprocket. If the pitch radius of the driven sprocket is 250 mm and the center to
center distance between the two sprocket is 400 mm, find the pitch and the
length of the chain.

 **B.** Derive an expression for minimum number of teeth required on a pinion to   **(10)**
avoid interference in involute gear teeth when it meshes with wheel.

{ Turn Over

Q5 A. What do you understand by coriolis component of acceleration? Explain with the help **(10)** of an example. Draw all the directions of coriolis component of acceleration.

B. A cylinder with mass of 50 kg is released from the rest on a plane inclined at 300 to **(10)** the horizontal. The diameter of the cylinder is 2 m. If the cylinder rolls without slipping, then compute, i) the speed of the center point C of the cylinder after it has moved 2 m along the inclined plane and ii) friction force acting on the cylinder.

Q6 A. Figure shows a Whitworth quick return motion mechanism. The various **(14)** dimensions are : OQ = 100 mm; OA = 200 mm; QC = 150 mm; CD = 500 mm. The crank OA makes an angle of 60^0 with the vertical and rotates at 120 rpm in the clockwise direction. By instantaneous center method find the velocity of the ram D. Compare your answer with relative velocity method.
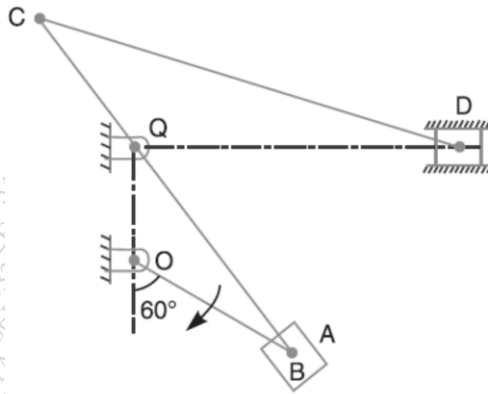
B. With the help of a neat sketch explain the terms base circle, prime circle and **(6)** pitch circle with respect to cams.