D 23462   (Pages : 2)   Name.........................

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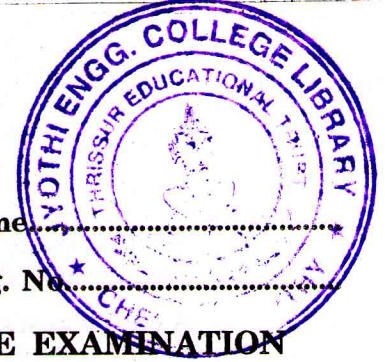
FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2011

ME 04 504—MECHANICS OF MACHINERY

(2004 Admissions)

Time : Three Hours   Maximum : 100 Marks

Part A

I. (a) Write a short note on kinematic inversion.

(b) What do you meant by ceriolis component of acceleration ? Write down the expression for it.

(c) How followers can be classified based on the surface in contact ?

(d) Explain the pressure angle of the cam and discucs how it is influenzed by the base circle of the cam.

(e) State law of gearing.

(f) Briefly explain the term 'interference' of gears.

(g) Define :

      (i) Type synthesis

      (ii) Number synthesis and

      (iii) Dimensional synthesis.

(h) Briefly explain the overlay method.   (8 × 5 = 40 marks)

Part B

II. (a) The driving shaft of a Hooke's joint has a uniform angular speed of 280 r.p.m. Determine the maximum permissible angle between the axes of the shafts to permit a maximum variation in speed of the driven shaft by 8% of mean speed.

Or

(b) In a four link mechanism, the crank AB rotates at 36 rad/s. The length of the links are AB = 200 mm, BC = 400 mm, CD = 450 mm and AD = 600 mm. AD is fixed link. At the instant AB is at right angle to AD, determine the velocity of the midpoint of link BC.

III. (a) It is required to set out a profile of a Cam to give the following motion to the reciprocating follower with a flat mushroom contact face :

      (i) Follower to have a stroke of 20 mm during 120° of cam rotation.

      (ii) Follower to dwell 30° of cam rotation.

      (iii) Follower to return to its initial position during 120° of cam rotation and

      (iv) Follower to dwell for remaining 90° of cam rotation.

The minimum radius of cam is 25 mm. The outstroke of the follower is performed with SHM and return stroke with equal uniform acceleration and retardation.

Or

Turn over
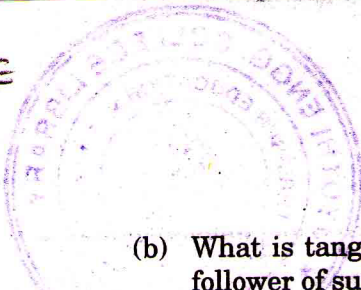
(b) What is tangent cam ? Derive the expression for the velocity and acceleration of a roller follower of such cam.

IV. (a) A pair of gears having 40 and 30 teeth respectively are of 25° involute form. The addendum length is 5 mm and module pitch is 2.5 mm. If the smaller wheel is driver and rotates at 1500 r.p.m. Find the velocity at the point of engagement and at the point of disengagement.

Or

(b) (i) Write a short note on gear materials.

(ii) In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m. in the anticlockwise direction about the centre of gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed, makes 300 r.p.m. in the clockwise direction, What will be the speed of gear B.

V. (a) Derive and explain Freudenstein's equation in the approximate synthesis of four–bar linkage.

Or

(b) Synthesize a four–bar mechanism to generate a function $y = \sin x$ for $0 \le x \le 90°$. The range of the output crank may be chosen as 60° while that of input crank be 120°. Assume three precision points. Assume fixed link to be 52.5 mm long and $\phi_1 = 105°$ and $\phi_1 = 66°$.

(4 × 15 = 60 marks)