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Question Paper Code : 51622

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Third Semester

Mechanical Engineering

ME 2203/ME 35/ME 1202 A/080120010/10122 ME 404 — KINEMATICS OF MACHINERY

(Regulation 2008/2010)

(Common to PTME 2203–Kinematics of Machinery for B.E. (Part–Time) Third Semester – Mechanical Engineering – Regulation 2009)

Time : Three hours Maximum : 100 marks

Note : A–3 Drawing Sheet is to be Supplied to the Examination

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate the machine and structure.
2. Classify the constrained motion.
3. Define instantaneous centre.
4. What is the expression for coriolis component of acceleration?
5. Define tangent cam.
6. What are the different motions of the follower?
7. State the law of gearing.
8. What are the methods to avoid interference?
9. Define velocity ratio.
10. What is the maximum efficiency of the screw jack?

PART B — (5 × 16 = 80 marks)

11. (a) Explain the working of two different types of quick return mechanisms. Derive an expression for the ratio of time taken in forward and return stroke for one of these mechanisms. (16)

Or

(b) Sketch and explain any three kinematic inversion of four–bar chain.

12. (a) (i) Derive an expression for the relationship between the angular velocities of links in terms of known link lengths, angular positions of links and angular velocity of input link, for a four–bar linkage. (6)

(ii) 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 A. The crank speed is 600 rpm clockwise. When the crank has turned 45° from the inner dead centre position, determine velocity of the slider A, Velocity of the point G and Angular velocity of the connecting rod AB (10)

Or

(b) By analytical method, Derive the velocity and acceleration for the reciprocating steam engine mechanism.

13. (a) A cam is designed for a knife edge follower with following data:

(i) Cam lift = 40 mm during 90° of cam rotation with SHM

(ii) Dwell for the next 30°

(iii) During the next 60° of cam rotation, the follower returns to original position with SHM

(iv) Dwell for the remaining 180°

Draw the profile of the cam when the line of stroke is offset 20 mm from the axis of the cam shaft.

Or

(b) In a cam with translating roller follower, the follower axis is offset to the right of Cam hinge by 12 mm. The roller radius is 10 mm and the cam rotates in the counter clock–wise direction. Layout the rise portion of the cam profile to meet the following specifications: Rise takes place during 180° of cam rotation of which for the first 90° the rise is with constant acceleration and the rest is with constant retardation. Take seven station points only. The lift of the cam is 30 mm and the least radius of the cam is 25 mm.

14. (a) Two gear wheels mesh externally to give a velocity ratio of 3 to 1. The involute teeth has 6 mm module and 20° pressure angle. Addendum is equal to one module. The pinion rotates at 90 rpm. Determine

(i) Number of teeth on pinion to avoid interference and the corresponding number on the wheel; (4)

(ii) The length of path and are of contact (4)

(iii) Contact ratio and (4)

(iv) The maximum velocity of sliding. (4)

Or

(b) (i) Derive an expression to determine the length of path of contact between two spur gears of different size. (10)

(ii) Briefly explain the sub–classification of compound gear trains with neat sketches. (6)

15. (a) Two pulleys, one 450 mm diameter and the other 200 mm diameter are in 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? (16)

Or

(b) (i) Derive an expression for the effort required to raise a load with screw jack taking friction into consideration. (8)

(ii) A 150 mm diameter value, against a steam pressure of 2 MN/m^2 is acting, is closed by means of a square threaded screw 50 mm in external diameter with 6 mm pitch. If the co–efficient of friction is 0.12, find torque required to turn the handle. (8)

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