F 3644   (Pages : 3)   Reg. No.....................

Name.....................

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Fifth Semester

Branch : Automobile Engineering / Mechanical Engineering

ME 010 504 /AU 010 504 – KINEMATICS OF MACHINERY (AU, ME)

(New Scheme – 2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours   Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 marks.

1. Sketch and define Transmission angle of a four-bar mechanism. What are the worst values of transmission angle?

2. Explain how the direction of Coriolis acceleration is obtained.

3. What are precision points in synthesis of mechanisms?

4. What is the significance of pressure angle in cam?

5. What are the advantages and disadvantages of involute gear tooth profile?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 marks.

6. Explain mechanical advantage and transmission angle related to four-mechanism.

7. What are the properties of instantaneous center?

8. Explain Overlay method.

9. Define undercutting in cam. How it occurs?

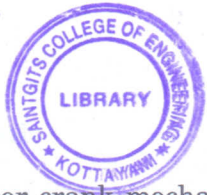10. What are the methods to avoid interference?

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*

Each full questions carries 12 marks.

11. Explain the working a quick return motion mechanism. Also derive an equation for the ratio of time taken for return stroke and forward strokes.

Or

Turn over

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12. The crank of a slider crank mechanism rotates clockwise at a constant speed of 300 r.p.m. The crank is 150 mm and the connecting rod is 600 mm long. Determine : (a) Linear velocity and acceleration of the midpoint of the connecting rod ; and (b) Angular velocity and angular acceleration of the connecting rod, at a crank angle of 45° from inner dead center position.

13. (a) Derive the expressions for the velocity and acceleration of the piston of a reciprocating engine mechanism.

    (b) A cam with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give motion to a roller follower, at the end of a valve rod, as describe below :

    (i) To raise the valve through 50 mm during 1200 rotation of the cam.

    (ii) To keep the valve fully raised through next 30°.

    (iii) To lower the valve during next 60° and

    (iv) To keep the valve closed during rest of the revolution.

    The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm. The line of the stroke is offset by 15 mm from the axis of the cam shaft. The displacement of the valve, while being raised and lowered is to take place with SHM.

    1. Draw the displacement diagram. Sketch roughly the shapes of velocity and acceleration diagrams.

    2. Draw the profile of the cam.

Or

14. Explain Coriolis component of acceleration. Derive the expression for Coriolis component of acceleration. Sketch its possible directions.

15. Explain two position and three position graphical synthesis of slider crank mechanism.

Or

16. Synthesis a four bar linkage that will in one of its position, satisfy the following values for the angular velocities and accelerations :

    $y = x^{1.3}$, $1 \le x \le 5$ using Chebyshev spacing for three precision points. Take $\varphi_o = 30°$, $\psi_o = 60°$, $\Delta\varphi = \Delta\psi = 90°$.

17. Discuss the various aspects of kinematics of a circular are cam with flat faced follower.

Or

18. A cam drives a flat reciprocating follower the following manner: During first 120° rotation of the cam, follower moves outwards through a distance of 20 mm with SHM. The follower dwells during next 30° of the cam rotation. During next 120° of cam rotation, the follower moves inwards with SHM. The follower dwells for next 90° of cam rotation. The minimum radius of the cam is 25 mm. Draw the profile of the cam.

19. Two unequal gears of involute profile are to give required gear ratio. Derive an expression for the minimum number of teeth required for the pinion in order to avoid interference.

Or

20. (i) State and prove the law of gearing.

    (ii) Show that the involute curves as the profile of mating gears satisfy the law of gearing.

(4 + 8 = 12 marks)

[5 × 12 = 60 marks]