

Code: 9A03401

B.Tech II Year II Semester (R09) Supplementary Examinations May/June 2017

KINEMATICS OF MACHINERY

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Explain with the help line diagram the 'Oscillatory cylinder engine mechanism'.
(b) A crank and slotted lever mechanism used in a shaper has a centre distance of 300 mm between the centre of oscillation of the slotted lever and the centre of rotation of the crank. The radius of the crank is 120 mm. Find the ratio of the time of cutting to the time of return stroke.
- 2 (a) What do you mean by straight line mechanism? Name the Different mechanisms which are used for approximate straight line motion.
(b) Describe Hart's mechanism with a neat sketch and prove that the tracing point describes a straight line path.
- 3 The crank of an engine 200 mm long and connecting rod length to crank radius is 4. The crank has turned through 45° from inner dead centre position. The instantaneous speed of rotation of the crank is 240 r.p.m. clockwise and it is increasing at the rate of 100 rad/s. Determine: (i) Acceleration of the mid-point of connecting rod. (ii) Angular acceleration of connecting rod. (iii) Acceleration of slider.
- 4 Derive an expression for the ratio of shafts velocities for Hooke's joint and draw the polar diagram depicting the salient features of driven shaft speed.
- 5 (a) Differentiate between: (i) Base circle and prime circle. (ii) Cam angle and pressure angle.
(b) Design a cam to raise a valve with simple harmonic motion through 5 cm in $1/3$ rd of a revolution, keep it fully raised through $1/12$ revolution and to lower it with simple harmonic motion in $1/6$ revolution. The valve remains closed during the rest of the revolution. The diameter of the roller is 2 cm and the minimum radius of the cam is 2.5 cm. The diameter of the cam shaft is 2.5 cm. The axis of the valve rod passes through the axis of the cam shaft rotates at uniform speed of 100 r.p.m. Find the maximum velocity and acceleration of a valve during raising and lowering.
- 6 (a) Explain the terms: (i) Module. (ii) Addendum.
(b) Calculate: (i) Length of path of contact. (ii) Arc of contact. (iii) The contact ratio when a pinion having 23 teeth drives a gear having teeth 57. The profile of the gears is involute with pressure angle 20° , module 8 mm and addendum equal to one module.
- 7 A belt drive is required to transmit 10kW from a motor running at 600 r.p.m. the belt is 12 mm thick and has a mass density of 0.001 gm/mm^3 Safe stress in the belt is not to exceed 2.5 N/mm^2 . Diameter of the driving pulley is 250mm whereas the speed of the driven pulley is 220 r.p.m the two shafts are 1.25 m apart. The coefficient of friction is 0.25. Determine the width of the belt.
- 8 Explain the working principal of any two of the following with good line diagrams:
(a) Differential gears.
(b) Reverted gear.
(c) Epicyclic gear train.
