BT-3/D-19   33025

KINEMATICS OF MACHINES

Option II
ME-207E

Time : Three Hours]   [Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Explain the term kinematic link. Give the classification of kinematic link. Also write notes on complete and incomplete constraints in lower and higher pairs, illustrating your answer with neat sketches. **10**

   (b) Explain Whitworth quick return motion mechanism with neat diagram. **10**

2. Write the relation between the number of instantaneous centres and the number of links in a mechanism. Discuss the three type of instantaneous centres for a mechanism. **20**

Unit II

3. Derive an expression for the magnitude and direction of Coriolis components of acceleration. **20**

4. The crank-pin circle radius of a horizontal engine is 300 mm. The mass of the reciprocating parts is 250 kg. When the crank has travelled 60° from I.D.C., the difference between the driving and the back pressures is 0.35 N/mm^2. The connecting rod length between centres is 1.2 m and the cylinder bore is 0.5 m. If the engine runs at 250 r.p.m. and if the effect of piston rod diameter is neglected, calculate : 1 pressure on slide bars, 2. thrust in the connecting rod, 3. tangential force on the crank-pin, and 4. turning moment on the crank shaft. **20**

Unit III

5. Give a neat sketch of the straight line motion 'Hart Mechanism' Prove that it produces an exact straight line motion. **20**

6. An effort of 1500 N is required to just move a certain body up on inclined plane of angle 12°, force acting parallel to the plane. If the angle of inclination is increased to 15°, then the effort required is 1720 N. Find the weight of the body and the coefficient of friction. **20**

7. Design a cam to raise a valve with simple harmonic motion through 50 mm in 1/3 of a revolution, keep if fully raised through 1/12 revolution and to lower it with harmonic motion in 1/6 revolution. The valve remains closed during the rest of the revolution. The diameter of the roller is 20 mm and the minimum radius of the cam is 25 mm. The diameter of the cam shaft is 25 mm. The axis of the valve rod passes through that axis of the camshaft. If the camshaft rotates at uniform speed of 100 r.p.m.; find the maximum velocity and acceleration of a valve during raising and lowering. 20

8. How does the velocity ratio of a belt drive effect, when some slip is taking place between the belt and the two pulleys ? Also, derive the condition for transmitting the maximum power in a flat belt drive. 20