Roll No. .. Total Pages : 04

BT-3/D-19 33106

KINEMATICS OF MACHINES

ME-207N

Time : Three Hours] [Maximum Marks : 75

Note : There are eight questions in total. Attempt *Five* questions in all, selecting *one* question from each Unit.

Unit I

1. (a) Define the Grubler's criterion for plane mechanism with mathematical expression. 3

   (b) Determine the number of freedom of the mechanism shown in the Figure 1 below : 2

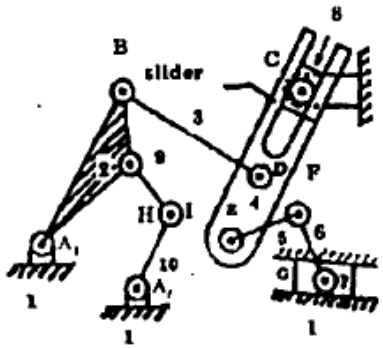

Fig. 1

(c) Define the following terms :

(i) Inversion

(ii) Degree of Freedom

(iii) Machine

(iv) Kinematic Chain

(v) Structure. 10

2. (a) Explain Grashof's criterion. 3

   (b) Some of the 4 bar linkages shown in Figure 2 where the number indicate the respective links in length in 'cm' :

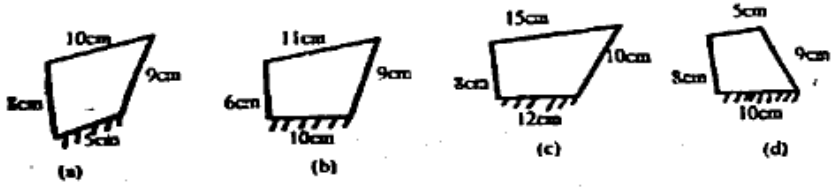

Fig. 2

Identify the nature of each mechanism whether : (i) Double crank (ii) Crank rocker (iii) Double rocker. Give reason in brief. 12

Unit II

3. Sketch and describe the working of crank and slotted lever quick return mechanism. Derive an expression to find the length of the stroke for the quick return mechanism. 15

4. It has the crank CB = 100 mm and a connecting rod BA = 300 mm with the centre of gravity G = 100 mm from B. The crankshaft has the speed of 75 rad/sec and an angular acceleration of 1200 rad/sec^2. Find :

(a) The velocity of G and the angular velocity of AB.

(b) The acceleration of G and the angular velocity of AB. 15

Unit III

5. (a) Perform the Kinematic analysis of the following exact straight line motion mechanisms :

(i) Peculiar Mechanism

(ii) Hart's Mechanism. 8

(b) Derive the expression for necessary condition of correct steering. Explain with neat sketch the Ackerman steering gear mechanism. 7

6. (a) Explain Pantograph mechanism with neat sketch. 7

(b) Prove that torque transmitted by a cone clutch, when the intensity of pressure is uniform, is given by, $T = \frac{2}{3}\frac{\mu W}{\sin\alpha}\left(\frac{r_1^3 - r_2^3}{r_1^2 - r_2^2}\right)$ with usual notations. 8

Unit IV

7. Construct a tangent cam and mention the important terms on it. Also, derive the expression for displacement velocity and acceleration of reciprocating roller follower when the roller has contact with nose. 15

8. Derive an expression to find the length of a belt in an open belt drive. 15