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BME-020

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

01787

BTMEVI

Term-End Examination

June, 2014

BME-020 : KINEMATICS & DYNAMICS OF MECHANISMS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. Use of calculator is allowed. All questions carry equal marks.*

1. (a) What do you understand by the terms 'mechanism' and 'machine' ? State how these differ from each other. *6*

(b) What is meant by inversion of a mechanism ? Describe with the help of suitable sketches the inversion of a single slider chain. *8*

2. (a) Find the degrees of freedom of mechanisms shown in Figure 1. 6

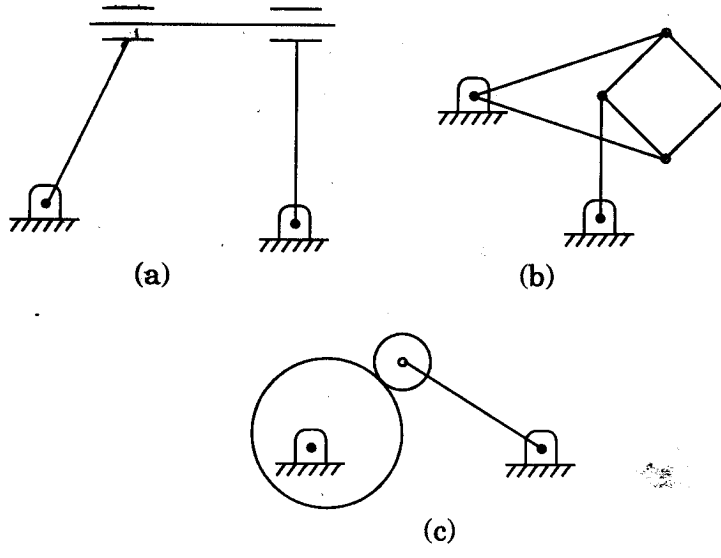

Figure 1

(b) In a slider-crank mechanism, the lengths of the crank and the connecting rod are 200 mm and 800 mm respectively. Locate all instantaneous centres of the mechanism for the position of the crank when it has turned 30° from inner dead centre position. Also find the velocity of the slider and the angular velocity of the connecting rod if the crank rotates at 40 rad/sec. 8

3. (a) What is the Coriolis acceleration component ? In which cases does it occur ? How is it determined ? 6

(b) Design a four-bar mechanism which can coordinate input and output angles as given below : *8*

Input Crank Angle :	30°	50°	80°
Output Crank Angle :	0°	30°	60°

4. (a) Compare belt drive with chain drive. Also give three applications of each drive. *6*

(b) Derive the relation between friction tensions on tight and slack side of flat belt drive. *8*

5. (a) What is path of contact ? Derive the relation for its magnitude. *10*

(b) Define following terms : *4*

(i) Pressure line and Pressure angle

(ii) Pitch Point

(iii) Module

(iv) Contact Ratio

6. (a) Draw the profile of a cam operating a knife edge follower having a lift of 30 mm. The cam raises the follower with simple harmonic motion for 150° of cam rotation followed by a period of dwell for 60°. The follower descends for the next 100° rotation of cam with uniform velocity again followed by a dwell period. The cam rotates at a uniform speed of 120 rpm and has a least radius of 20 mm. *8*

(b) Explain the following terms : 6

(i) Centrifugal and inertia governor

(ii) Stability and sensitiveness

(iii) Power and effort of a governor

7. (a) Using the method of direct and reverse crank, prove that for a four stroke, five cylinder radial engine

(i) primary force can be completely balanced by a rotating mass placed in the direction opposite to crank.

(ii) the secondary forces are completely balanced. 8

(b) Explain clearly the terms static and dynamic balancing. 6

8. (a) What do you mean by dynamically equivalent system ? Explain. 4

(b) A Porter governor has all four arms 300 mm long. The upper arms are pivoted on the axis of rotation and the lower arms are attached to the sleeve at a distance of 35 mm from the axis. The mass of each ball and the sleeve are 7 kg and 54 kg respectively. If the extreme radii of rotation of the ball are 200 mm and 250 mm, determine the range of speed of the governor. 10