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BME-020

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

00002

Term-End Examination

December, 2011

BME-020 : KINEMATICS & DYNAMICS OF MECHANISMS

Time : 3 hours *Maximum Marks : 70*

Note : *Answer **any five** of the following questions. Use of non programmable **scientific** calculator is allowed.*

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1. (a) Define and explain the term kinematic chain. What is relation between number of pairs and number of links in a kinematic chain ? Also write the equation showing the relation between number of links and number of joints. **10+4**

(b) Define and explain the terms : mechanism, machine, link and kinematic pair.

2. (a) Figure 1 shows a pin-jointed four bar linkage having the following dimensions : **10+4**
Fixed link AD=4 m ; Driving link AB=1.5 m
Driven link CD = 2.5 m ; Connecting link BC = 3m Angle BAD = 60°. Link AB revolves at 25 rpm.
Determine :
(i) Angular velocity of link CD and
(ii) Angular velocity of link BC.

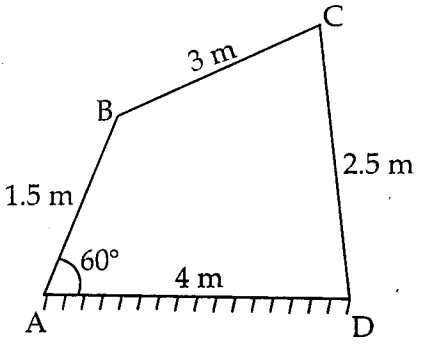

Figure - 1

(b) Define Kennedy Theorem. Describe the different types of instantaneous centres for a mechanism.

3. (a) What is the importance of finding accelerations of various points in a mechanism ? Name the two different methods of finding acceleration in a mechanism. **7+7**

(b) Describe the method of drawing the acceleration diagram for a slider - crank mechanism.

4. (a) Define and explain the terms : 4+10
Belt - drive ; chain - drive ; slip, and creep of a belt.

(b) Obtain the conditions for the maximum power transmitted by a flat belt from one pulley to another pulley.

5. (a) Define and Explain the terms : 4
Helicalgears ; worm gears; spur gears; berel gears.

(b) State and prove the law of gear tooth action for constant velocity ratio and show how the involute teeth profile satisfied the condition. 10

6. In a reverted epicyclic train, the arm F carries two wheels A and D and a compound wheel B - C. The wheel A meshes with wheel B and the wheel D meshes with wheel C. The numbers of teeth on wheel A , D and C are 80, 48 and 72 respectively. Find the speed and direction of wheel D when wheel A is fixed and arm F, makes 200 rpm clock wise. 14

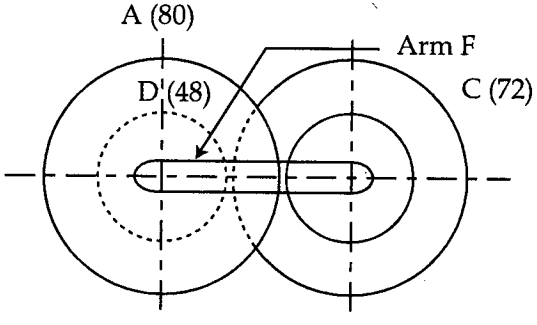

Figure - 2

7. A disturbing mass 600 kg is attached to a shaft. The shaft is rotating at a uniform angular velocity ω rad/sec and the distance of the C.G of the disturbing mass from the axis of rotation is 270 mm. The disturbing mass is to be balanced by two masses in two different planes. The distances of C.G. of the balancing masses from the axis of rotation is 450 mm each. The distances between the two planes of balancing masses is 1.5 m and the distance between the plane of the disturbing mass and one of the planes of the balancing masses is 300 mm. Determine : **14**

(a) The distance between the plane of disturbing mass and the plane of the other balancing mass.

(b) Magnitude of balancing mass when the planes of balancing masses are on either side of the plane of the disturbing mass.

8. (a) What are the different types of the governors ? Differentiate between centrifugal governors and inertia governors. **4+10**

(b) Draw the profile of a cam operating a knife - edge follower when the axis of the follower passes through the axis of cam shaft from the following data :

(i) Follower to move outwards through 40 mm during 60° of cam rotation,

(ii) Follower to dwell for the next 45°,

(iii) Follower to return to its original position during next 90°,

(iv) Follower to dwell for the rest of the cam rotation.

The displacement of the follower is to take place with simple harmonic motion during both the outward and the return strokes. The least radius of cam is 50 mm. If the cam rotates at 300 rpm, determine the maximum velocity and acceleration of the follower during the outward stroke and return stroke.