BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING) (BTMEVI)

00498

Term-End Examination

December, 2013

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 is a kinematic pair ? How can it be classified ? Explain with examples. **8**

(b) What is meant by degree of freedom of a mechanism ? Explain the Grubler's criterion for plane mechanism to obtain the degree of freedom. **6**

2. (a) A four bar kinematic chain is shown in figure (1). Draw its inversions and identify the nature of each mechanism. **4**

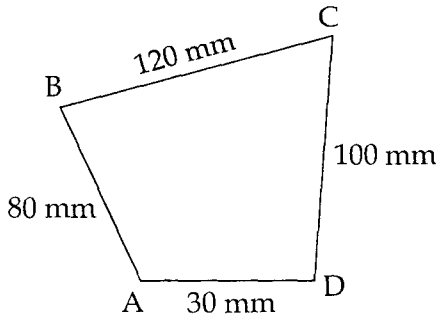

Figure - 1

(b) In a mechanism shown in figure (2) the crank AB rotates about point A at uniform speed of 240 rpm in clockwise direction. The link CD oscillates about the fixed point D, which is connected to link AB by a coupler link BC. The slider F moves in horizontal guides, being driven by the link EF. **10**

Determine :

(i) velocity of slider F

(ii) angular velocity of link CD.

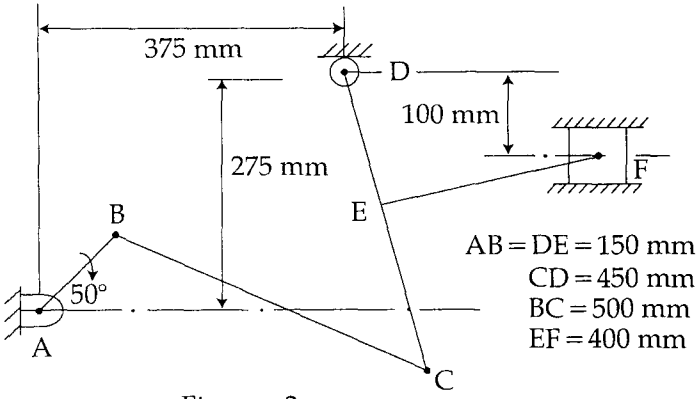

Figure - 2

3. Synthesize a four bar mechanism to generate a function $y = \log_{10} x$ in the interval $1 \leq x \leq 10$. The input crank length is 50mm. The input crank is to rotate from 45° to 105° while the output link moves from 135° to 225°. Use three accuracy points with Chebyshev's spacing. **14**

4. (a) Explain the effect of centrifugal tension on the power transmission capacity of belt drive. **10**

   (b) Explain the following : **4**

   (i) Law of belting

   (ii) Slip

   (iii) Open belt drive and crossed belt drive

   (iv) Flat belt and V belt drive

5. (a) What do you mean by interference between two mating gears ? State the condition under which interference can be avoided. 10

(b) Compare cycloidal and involute tooth profile. 4

6. (a) A cam is to give following motion to a knife edged follower : 8

(i) To raise the follower through 30mm with uniform acceleration and deceleration during 120° cam rotation.

(ii) Dwell for next 30° cam rotation

(iii) lower the follower with uniform velocity during the next 90° cam rotation

(iv) Dwell for the rest of cam rotation

The cam has a minimum radius of 30 mm and rotates counter clockwise at a uniform speed of 800 rpm. Draw the cam profile if the line of stroke of the follower passes through the axis of cam shaft.

(b) Differentiate between governor and flywheel. 6

7. A shaft carries four masses in parallel planes A, B, C, and D, in this order, along it. The masses at B and C are 18 kg and 12.5 kg, respectively, and each has an eccentricity of 6 cm. The masses at A and D have an eccentricity of 8 cm. The angle between the masses at B and C is 100°, and that between the masses at B and A is 190° (both angles being measured in the same direction). The axial distance between the planes A and B is 10 cm and that between B and C is 20 cm. If the shaft is in complete dynamic balance, determine : **14**

(i) the masses at A and D

(ii) the distance between the planes C and D, and

(iii) the angular position of the mass at D.

8. The torque delivered by a two stroke engine is represented by : **14**

$T = (1000 + 300 \sin 2\theta - 500 \cos 2\theta)$ N.M where θ is the angle turned by the crank from the inner dead centre position. The engine speed is 250 rpm. The mass of the flywheel is 400 kg and radius of gyration 400mm. Determine.

(a) power developed

(b) total percentage fluctuation of speed

(c) angular acceleration of flywheel when the crank has rotated through an angle of 60° from inner dead centre.

(d) maximum angular acceleration and retardation of the flywheel.