BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING

(COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

June, 2011

BME-020 : KINEMATICS & DYNAMICS OF MECHANISMS

Time : 3 hours *Maximum Marks : 70*

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

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1. (a) Derive the relation for ratio of tensions for a flat pulley. **5+9**

(b) Find the minimum number of teeth on the pinion to avoid interference when it meshes with gears having gear ratios 1 and 3 for the following pressure angles :

(i) $14\frac{1}{2}^{\circ}$ and

(ii) 20°. Assume standard teeth in the gears.

2. (a) Explain different type of kinematic pairs. **6+8**

(b) Plot all the instantaneous centres for a slider crank chain OAB and explain how velocity of piston can be expressed in terms of crank speed ?

3. (a) Explain Coriolis' component of acceleration. **4+10**

(b) A quick return motion mechanism is shown in Figure - 1. The crank rotates at 20rad/s in anti-clockwise sense. Determine angular acceleration of the slotted link 3.

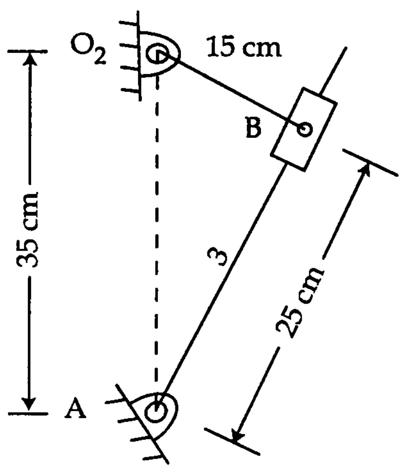

Figure - 1

4. (a) Classify cams according to shape. **4+10**

(b) A cam operates a flat faced follower. Draw cam profile for the following data :

Lift of follower	= 30 mm
Base circle radius of cam	= 30 mm
Angle of ascent with SHM	= 120°
Dwell angle after ascent	= 30°

Return angle of the follower with uniform acceleration and retardation. = 120°

5. (a) Explain Chebyshev's spacing of accuracy points. **4+10**

(b) A pinion of 8 cm pitch diameter drives a 25 cm pitch diameter gear having pressure angle equal to 20°. Both pinion and gear are mounted mid way on simply supported shafts. Make force analysis of the pair if input torque is 6000 N cm.

6. (a) A damped spring mass system has 4 kg mass suspended by a helical spring of stiffness 10 N/cm. If damping factor is 40 Nm/sec determine. **6+8**

(i) logarithmic decrement

(ii) number of cycles after which the original amplitude is reduced to 1%.

(b) A machine weighing 650 kg operates at 1500 rpm. It has and unbalance of magnitude 0.1 kgm. The damping factor of isolators over which machine mounted is 0.1. Determine stiffness of isolators so that the transmissibility is less than or equal to 0.15. Determine amplitude of force transmitted.

7. (a) Explain field balancing of large rotors. 5+9

(b) A shaft carries three pulleys A, B and C. The distance between A and B is 600 mm and that between B and C is 1200 mm. The pulleys A, B and C weigh 25 N, 20 N and 30 N respectively. Each of these pulleys has eccentricity equal to 25 mm. The angular position of out of balance masses in pulleys B and C with respect to that in pulley A are 90° and 210° respectively. Determine balancing masses to revolve each at radii 125 mm in two planes located mid way between the pulleys.

8. (a) Examine whether a six cylinder Inline I.C. engine which is being used in buses and trucks is balanced or not. If it is not balanced, determine the magnitude of unbalance. 6+8

(b) The arms of a Porter governor are each 25 cm long and pivoted on the governor axis. The mass of each ball is 5 kg and mass of central load on the sleeve is 30 kg. The radius of rotation of the balls is 15 cm when the sleeve begins to rise and reaches a value of 20 cm for the maximum speed. Determine speed range.