FACULTY OF ENGINEERING

B.E. 2/4 (Mech./Prod/Automobile Engg.) II Semester (Main) Examination, May/June 2011

KINEMATICS OF MACHINES

Time : 3 Hours]   [Max. Marks : 75

Note : Answer **all** questions from Part – A. Answer any **five** questions from Part – B.

### PART – A   (Marks : 25)

1. Differentiate with examples (a) Lower pair and (b) Higher pairs.   2

2. Discuss about Watt mechanism.   3

3. State and prove Kennedy's Theorem.

4. What are centripetal and tangential components of acceleration ?   2

5. Define friction circle and friction axis.   2

6. Derive the relation for ratio of belt tensions in a flat belt drive.   3

7. Discuss about classification of followers.   2

8. Differentiate between a brake and a dynamometer.   2

9. Explain about Epi-cyclic gear train.   3

10. What is interference in gears ? How to avoid it ?   3

PART – B   (Marks : 50)

11. (a) How are Whitworth quick-return mechanism and crank and slotted-lever mechanism are different from each other ? Discuss.   4

    (b) Give inversions of single slider crank mechanism.   6

12. Figure shows configuration of an engine mechanism. The dimensions are as follows : Crank OA = 200 mm, connecting rod AB = 600 mm, AD = 200 mm. At the instant, the crank has an angular velocity of 50 rad/sec clockwise and an angular acceleration of 800 rad/s^2. Calculate :

    (i)   Velocity of D and angular velocity of AB.

    (ii) Acceleration of D and angular acceleration of AB.   10
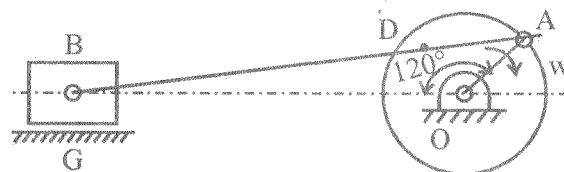
13. A countershaft is to be driven at 240 rpm from a driving shaft rotating at 100 r.p.m. by an open-belt drive. The diameter of the driving pulley is 480 mm. The distance between the centre line of shafts is 2 m. Find the width of the belt to transmit 3 kW. Power if the safe permissible stress in tension is 15 N/mm^2 width of the belt. Take $\mu = 0.3$. **10**

14. A cone clutch with a semi-cone angle of 15° transmits 10 kW at 600 r.p.m. The normal pressure intensity between the surfaces in contact is not to exceed 100 kN/m^2. The width of the friction surfaces is half of the mean diameter. Assume $\mu = 0.25$. Determine

   (i)   the outer and inner diameters of the plate.

   (ii) width of the cone face.

   (iii) the axial force to engage the clutch. **10**

15. Two 20° involute spur gears having a velocity ratio of 2.5 mesh externally. Module is 4 mm and the addendum is equal to 1.23 module. Pinion rotates at 150 r.p.m. Find :

   (i) the minimum number of teeth on each wheel to avoid interference.

   (ii) the number of pairs of teeth in contact. **10**

16. A flat-faced mushroom follower is operated by a uniformly rotating cam. The follower is raised through a distance of 25 mm in 120° rotation of the cam, remains at rest for the next 30° and is lowered during further 120° rotating of the cam. The follower moves with uniform acceleration and deceleration during ascent and descent.

   The least radius of the cam is 25 mm which rotates at 300 r.p.m. Draw the cam profile and determine the maximum acceleration of the follower. **10**

17. Write short notes on : **10**

   (a) Belt transmission dynamometer.

   (b) Ackerman steering Gear mechanism.

   (c) Hooke's Joint.

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