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AU/IP/ME–403

B. E. (Fourth Semester)
EXAMINATION, June, 2011
(Common for AU, IP & ME Engg. Branch)
THEORY OF MACHINES AND MECHANISMS

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Answer any *five* questions selecting one question from each Unit. All questions carry equal marks. Assume suitable data if necessary. Draw neat sketches wherever needed.

Unit – I

1. Explain different kinds of kinematic pairs giving example for each *one* of them. 20

Or

2. Explain the working of Ackerman stearing gear and derive an expression for velocity ratio. 20

Unit – II

3. In a four bar chain ABCD, link AD is fixed and the crank AB rotates at 10 radians per second clockwise. Lengths of the links are AB = 60 mm; BC = CD = 70 mm; DA = 120 mm. When angle DAB = 60° and both B and C lie on the same side of AD, find : 20
   (a) Angular velocities (magnitude and direction) of BC and CD.
   (b) Angular acceleration of BC and CD.

P. T. O.

Or

4. Explain the procedure to construct Klein's construction to determine the velocity and acceleration of a slider crank mechanism. 20

Unit – III

5. A pinion having 20 involute teeth of module pitch 6 mm rotates at 200 r.p.m. and transmits 1·5 kW to a gear wheel having 50 teeth. The addendum on both the wheels is 1/4 of the circular pitch. The angle of obliquity is 20°. Find : 20
   (a) The length of the path of approach.
   (b) The length of the arc of approach.
   (c) The normal force between the teeth at an instant where there is only pair of teeth in contact.

Or

6. State and prove the law of gearing. Show that involute profile satisfies the conditions for correct gearing. 20

Unit – IV

7. Draw the profile of a cam that gives a lift of 40 mm to a rod carrying a 20 mm diameter roller. The axis of the roller passes through the centre of the cam. The least radius of the cam is 50 mm. The rod is to be lifted with simple harmonic motion in a quarter revolution and is to be dropped suddenly at half revolution. Determine the maximum velocity and maximum acceleration during the lifting. The cam rotates at 60 r.p.m. 20

Or

8. Deduce expressions for the velocity and acceleration of the follower when it moves with simple harmonic motion. 20

Unit – V

9. What is the effect of the gyroscopic couple on the stability of a four wheeler while negotiating a curve ? In what way this effect along with that of the centrifugal force limit the speed of the vehicle ? 20

Or

10. An aeroplane flying at 240 km/hr. turns towards left and completes a quarter circle of 60 m radius. The mass of the rotary engine and the propeller of the plane amounts to 450 kg with a radius of gyration of 320 mm. The engine speed is 2000 r.p.m. clockwise when viewed from the rear. Determine the gyroscopic couple on the aircraft and state its effect. In what way is the effect changed when the aeroplane turns towards right ? 20