Fifth Semester B.Tech. Degree Examination, December 2015
(2008 Scheme)
08.503 : THEORY OF MACHINES (MP)

Time : 3 Hours

Max. Marks : 100

Instructions : *Answer **all** questions from Part – **A** and **any one** from **each** Module of Part – **B**.*

PART – A

1. State and explain Grashof's law of 4-bar mechanism.

2. What is mobility of a mechanism ?

3. Explain any accurate straight line mechanism.

4. What is an instant centre ? How are they classified ?

5. Derive an expression for Corioli's component of acceleration.

6. Explain the working of a differential band brake.

7. Compare involute tooth profiles and cycloidal tooth profile.

8. What is an epicyclic gear train ?

9. Describe different types of cam follower mechanism.

10. What is pressure angle of gear drive ? (10×4=40 Marks)
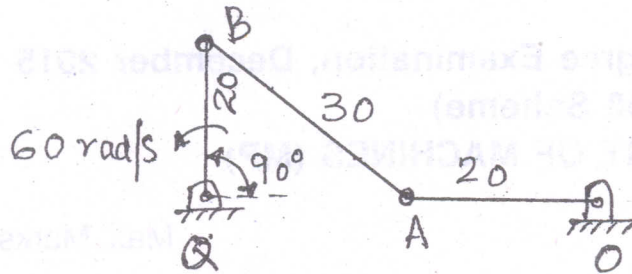
PART – B
Module – I

11. a) Derive Freudenstein's equation in standard form.

  b) Design a four link mechanism to co-ordinate three positions of the input and the output link as follows :
   $\theta_1 = 20°$; $\theta_2 = 35°$; $\theta_3 = 50°$
   $\phi_1 = 35°$; $\phi_2 = 45°$; $\phi_3 = 60°$

P.T.O.

12. a) Prove Aronhold and Kennedy's theorem relating to instant centre.

b) For the mechanism shown in fig. determine the angular velocity of link AB.

Module – II

13. a) Derive a relation for ratio of belt tension for an open belt drive.

b) A leather belt transmits 10 kW from a motor running at 600 rpm by an open belt drive. The diameter of the driven pulley of the motor is 350 mm, the centre distance between the pulleys 4 m and speed of the driven pulley 180 rpm. The belt weighs 1100 kg/m^3 and maximum allowable tension in the belt is 2.5 N/mm^2. μ = 0.25. Find the width of the belt assuming the thickness to be 10 mm.

14. a) Derive a relation for power transmitted by a plate clutch.

b) A single plate clutch having two active surfaces transmit 10 kW of power and the maximum torque developed is 120 N-m. Axial pressure is not to exceed 10 kN/m^2. Outer diameter of the friction plate is 1.3 times the inner diameter. Determine the diameters and the axial force exerted by the springs. Assume uniform wear and coefficient of friction 0.25.

Module – III

15. a) State and prove the law of gearing.

b) Derive a relation to determine the length of contact of two involute spur gears during meshing.

16. a) Explain different kinds of follower motions in cam drives.

b) 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 SHM 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 rpm.   **(20×3=60 Marks)**