Reg. No. : ....

Name : ....

Sixth Semester B.Tech. Degree Examination, May 2012
(2008 Scheme)
## 08-602 : DYNAMICS OF MACHINERY (MP)

Time : 3 Hours

Max. Marks : 100

Instructions : 1) Answer **all** questions from Part **A**.

2) Answer **one** question each from Module **I, II, III** of Part **B**.

PART – A

1. What do you mean by applied and constrained forces ? Explain.

2. What are freebody diagrams of a mechanism ? How are they helpful in finding the various forces acting on various members of the mechanism ?

3. State and explain D'Alembert's principle.

4. What do you mean by dynamical equivalent system ? Explain.

5. What is meant by static and dynamic unbalance in machinery ?

6. What is a function of a governor ? How does it differ from a flywheel ?

7. What do you mean by gyroscopic couple ? Derive a relation for its magnitude.

8. What are free, damped and forced vibrations ? Explain.

9. What is logarithmic decrement ? Derive the relation for the same.

10. Derive from first principle, a relation for the displacement of mass from the equilibrium position of a damped vibratory system with harmonic forcing.
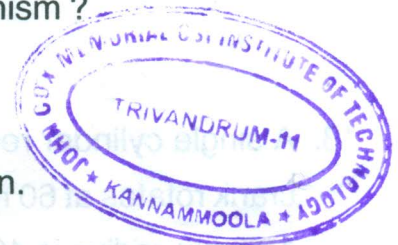
(10×4=40 Marks)

PART – B

Module – I

11. Determine the required input torque on the crank of a slider crank mechanism for a static equilibrium when the applied piston load is 1500N. The length of the crank and connecting rod are 40 mm and 100 mm respectively and the crank has turned through 45° from the inner dead centre.

OR

12. The effective steam pressure on the piston of a vertical steam engine is 200 kN/m² when the crank is 40° from the inner dead centre on the down stroke. The crank length is 300 mm and the connecting rod length is 1200 mm. The diameter of the cylinder is 800 mm. What will be the torque on the crank shaft if the engine speed is 300 rpm and the mass of the reciprocating parts 250 kg ?

Module – II

13. A single cylinder reciprocating engine has a reciprocating mass of 60 kg. The crank rotates at 60 rpm and stroke is 320 mm. The mass of the revolving parts at 160 mm radius is 40 kg. If two thirds of the reciprocating parts and the whole of the revolving parts are to be balanced, determine the

1) balance mass required at a radius of 350 mm

2) unbalanced force when the crank has turned 50° from the top dead centre

OR

14. In a Hartnell governor, the length of the ball and sleeve arm are equal. The extreme radii of rotation of the balls are 60 mm and 80 mm and the corresponding speeds are 160 rpm and 175 rpm. Each ball has a ball of 2 kg. Find the spring stiffness and the initial compression of the central spring.

Module – III

15. In a spring mass vibrating system, the natural frequency of vibration is 3.56 Hz. When the amount of the suspended mass is increased by 5 kg, the natural frequency is reduced to 2.9 Hz, determine the original unknown mass and spring constant.

OR

16. A centrifugal pump rotating at 400 rpm is driven by an electric motor at 1200 rpm through a single stage reduction gearing. The moments of inertia of the pump impeller and the motor are 1500 kg m^2 and 450 kg m^2 respectively. The lengths of pump shafts and motor shafts are 500 mm and 200 mm, and their diameters are 100 and 50 mm respectively. Neglecting the inertia of the gears, find the frequency of torsional oscillations of the system. G = 85 GN/m^2.   **(3×20=60 Marks)**