FACULTY OF ENGINEERING
B.E. 3/4 (M/P/AE) I Semester (Suppl.) Examination, June 2012
DYNAMICS OF MACHINES

Time : 3 Hours]　　　　　　　　　　　　　　　　　　　　[Max. Marks : 75

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

PART – A　　　　　　　　　　　　　　　　(25 Marks)

1. State the conditions to be satisfied for a dynamically equivalent system.

2. Explain how gyroscope is used as a stabilization device.

3. Explain the advantage of spring loaded governors over dead weight type governors.

4. Explain hunting of a governor.

5. Write the functions of engine flywheels and machine flywheels.

6. Explain why complete balancing of reciprocating masses is not done.

7. How complete balancing in achieved on multi cylinder in-line engines ?

8. Explain the term logarithmic decrement.

9. Define transmissibility ratio and vibration isolation.

10. State the conditions to be satisfied for an equivalent system to a geared system.

PART – B　　　　　　　　　　　　　　　　(50 Marks)

11. The rotor of the turbine of a yacht makes 1200 rpm clockwise when viewed from stern. The rotor has a mass of 750 kg and its radius of gyration is 250 mm. Find the maximum gyroscopic couple transmitted to the hull (body of the yacht) when yacht pitches with maximum angular velocity of 1 rad/s. What is the effect of this couple ?

12. In a Porter governor, the mass of the central load is 18 kg and the mass of each ball is 2 kg. The top arms are 250 mm, while the bottom arms are 300 mm long. The friction of the sleeve is 14 N. If the top arms make 45° with the axis of rotation in the equilibrium position, find the range of speed of the governor in that position.

13. A machine has to carry out punching operation at the rate of 10 holes per minute. It does 6 kN-m of work per mm^2 of the sheared area in cutting 25 mm diameter holes in 20 mm thick plates. A flywheel is fitted to the machine shaft which is driven by a constant torque. The fluctuation of speed is between 180 and 200 rpm. The actual punching takes 1.5 seconds. The frictional losses are equivalent to 1/6 of the work done during punching. Find, power required to drive the punching machine.

14. Four masses A, B, C and D revolve at equal radii and equal speed over a shaft. The mass B is 7 kg and the radii of C and D make angles of 90° and 240° respectively with the radius of B. Find the magnitude of masses A, C and D and the angular position of A so that the system may be completely balanced.

15. A shaft of diameter 10 mm carries at its centre a mass of 12 kg. It is supported by two short bearings, the centre distance of which is 400 mm. Find the whirling speed ;
    1) Considering the mass of the shaft.
    2) Neglecting the mass of the shaft.
       The density of shaft material is 7500 kg/m^3.

16. A shaft of 100 mm diameter and 1 m long is fixed at one end and the other end carries a flywheel of mass 1 tonne. The radius of gyration of the flywheel is 0.5 m. Find the frequency of torsional vibrations, if the modulus of rigidity for the shaft material is 80 GN/m^2.

17. Write short note on the following :
    a) Direct and reverse crank method.
    b) Dunkerley's method.
    c) Stability, ischronism, sensitivity of governors.