[EME-305]
B.Tech. Degree Examination
Mechanical Engineering
V SEMESTER
DYNAMICS OF MACHINERY
(Effective from the admitted batch 2015–16)

Time: 3 Hours  Max.Marks: 60

Instructions:  Each Unit carries 12 marks.
Answer all units choosing one question from each unit.
All parts of the unit must be answered in one place only.
Figures in the right hand margin indicate marks allotted.

MODULE-I

1. Determine the required input torque T for the static equilibrium of the four bar mechanism shown in the figure. Forces F2 and F3 have magnitudes of 50 N and 75 N, respectively. Forces F2 acts in the horizontal direction. Use both graphical and analytical methods. AB=30 cm, BC=40 cm, CD=50 cm and the fixed link AD=75 cm and CE=15 and CF= 20 cm

OR

2. A petrol engine has stroke of 120mm and connecting rod is 3 times the crank length. The rotates at 1500 r.p.m in clock wise direction. Determine:  
a) velocity and acceleration of piston  
b) angular acceleration and angular velocity of the connecting rod ,when piston travelled one-fourth of stroke form I.D.C
MODULE-II

3. a) Explain the term height of the governor. Derive an expression for the height in the case of a Watt governor. What are the limitations of Watt governor?  
b) The arms of a porter governor are each 250mm long and pivoted on the governor axis. The mass of each ball is 5 kg and the mass of the central sleeve is 30kg. The radius of rotation of the balls is 150mm. when the sleeve reaches to raise of 200 mm for the maximum speed. Determine the speed range of the governor. If the friction sleeve is equivalent of 20N of the load sleeve, determine the speed range is modified?  

OR

4. A porter governor has equal arms each arms 250mm long and pivoted on the axis of rotation. Each ball has a mass of 5kg and the mass of the central load on the sleeve is 25kg. The radius of rotation of the balls 150mm. Determine when the governor begins to lift and reach 200mm. If the governor is in the following cases:  
a) when the friction at the sleeve is neglected, and  
b) when the friction at the sleeve is equivalent to 10N  

MODULE-III

5. Four masses A, B, C and D revolve at equal radii and are of equal speed along shaft. the mass B is 7 kg and radii of C and D make angle of 90° and 2400° respectively with radius of B. find magnitude of mass A, C and D and angular position of A so that the system may completely balanced  

OR

6. The following data refer to two cylinder locomotive with cranks at 90°; diameter =1.8m; Distance between cylinder centre line =0.65m; Distance between the driving wheel central planes =1.55m.  
Determine: I. the fraction of the reciprocating masses to be balanced, if the hammer blow is not exceed 46 KN at 96.5km.p.h; 2. the variation in tractive effort and 3. The maximum swaying couple
MODULE-IV

7. a) Write about damped and undamped vibrations  
b) Write about single degree of freedom systems

OR

8. The measurements on a mechanical vibrating system show that it has a mass of 8kg and the springs can be combined to give an equivalent spring of stiffness 5.4N/mm. If the vibrating system has a dashpot attached which exerts a force of 40N when the mass has a velocity of 1m/s, find:
   a) Critical damping coefficient,  
   b) Damping factor,  
   c) Logarithmic decrement and  
   d) Ratio of two consecutive amplitudes

MODULE-V

9. a) What do you understand by gyroscopic couple? Derive a formula for its magnitude?  
b) The turbine rotor of a ship has a mass of 3500kg. It has a radius of gyration of 0.45m and a speed of 3000r.p.m. clockwise when looking from stern. Determine the gyroscopic couple and its effect upon the ship:
   i) When the ship is steering to the left on a curve of 100 m radius at a speed of 36km/h  
   ii) When the ship is pitching in a simple harmonic motion. The blow falling. With its maximum velocity. The period of pitching is 40 seconds and the total angular displacement between the two extreme positions of pitching is 12 degrees

OR

10. Each road wheel of motor cycle has moment of inertia of 1.5 kg-m². The Rotating parts of the engine of motor cycle have a mass moment of inertia of 0.25kg-m2. The speed of engine is 5 time the speed of wheels and is in same sense. The mass of the motor cycle with its rider is 250kg and its centre of gravity is 0.6m above the ground level. Find the angle of heel if the cycle is travelling at 50km/h and is taking a turn of 30m radius. The wheel diameter is 0.6m