Indian Maritime University
(A Central University, Govt. Of India)
B. Tech(Marine Engineering)
End Semester Examination Dec-2019/Jan-2020
Semester IV
Mechanics of Machines - II
(UG11T1403/2403)

Date:04-01-2020	Max Marks:**70**
Time:3 Hrs	Pass Marks: **35**

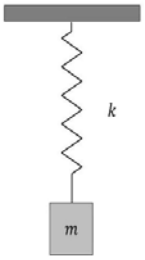
Part – A (compulsory)
Answer the following (10x2=20 Marks)

1. Why balancing of rotating parts is necessary for high speed engine?
2. What is meant by hammer blow of locomotive wheel.
3.Define Resonance.
4.Write the expression for natural frequency of longitudinal vibrations considering the mass of the shaft.
5.Define Critical speed.
6. What is logarithmic decrement for damped vibration?
7.Define damping.
8.Explain transmissibility as referred to in the vibratory system.
9.What is meant by under damping.
10. Write the expression for the amplitude of forced vibrations.

Part – B
Answer any 5 out of 7 questions (5 x 10= 50 marks)

11. Four masses m_1, m_2, m_3 and m_4 are 200Kg, 300Kg, 240Kg, and 260Kg respectively. The corresponding radii of rotation are 0.2m, 0.15m, 0.25m and 0.3m respectively and the angle between successive are 45^0, 75^0 and 135^0. Find the position and magnitude of the balance mass required if its radius of rotation is 0.2m.

12. By Rayleigh's method, determine the natural frequency of the mass and spring system, considering the mass of the spring system as shown in Q.Fig12.



Q.Fig12

13. A shaft of length 0.75 m, supported freely at the ends, is carrying a body of mass 90 kg at 0.25 m from one end. Find the natural frequency of transverse vibration. Assume E = 200 GN/m^2 and shaft diameter = 50 mm.

14. Calculate the whirling speed of a shaft 20 mm diameter and 0.6 m long carrying a mass of 1 kg at its mid-point. The density of the shaft material is 40 Mg/m^3, and Young's modulus is 200 GN/m^2. Assume the shaft to be freely supported.

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

16. A single cylinder vertical petrol engine of total mass 300 kg is mounted upon a steel chassis frame and causes a vertical static deflection of 2 mm. The reciprocating parts of the engine has a mass of 20 kg and move through a vertical stroke of 150 mm with simple harmonic motion. A dashpot is provided whose damping resistance is directly proportional to the velocity and amounts to 1.5 kN/m per second. Considering that the steady state of vibration is reached; determine:

(a) the amplitude of forced vibrations, when the driving shaft of the engine rotates at 480 r.p.m. **(6)**

(b) the speed of the driving shaft at which resonance will occur. **(4)**

17. A machine part of mass 2 kg vibrates in a viscous medium. Determine the damping coefficient when a harmonic exciting force of 25 N results in a resonant amplitude of 12.5 mm with a period of 0.2 second. If the system is excited by a harmonic force of frequency 4 Hz what will be the percentage increase in the amplitude of vibration when damper is removed as compared with that with damping.

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