

Regd. No.

--	--	--	--	--	--	--	--	--	--

B.E./B.Tech. DEGREE EXAMINATIONS, April/May 2012
V – Semester, Mechanical Engineering
Regulations 2004
ME 373 – Dynamics of Machines

(69)

Duration: 3-Hours

Max. Marks: 100

Answer ALL questions
Part – A (10X2 = 20 marks)

- 1 Define the D'Alembert's principle for the rotation and hence state the inertia torque?
- 2 Define the following terms related to flywheel.
i) Co-efficient of fluctuation of energy ii) Co-efficient of fluctuation of speed
- 3 What are the criteria for the balance of a shaft fitted with rotating masses at different positions along its length?
- 4 What is meant by hammer blow and its effect in case of a locomotive?
- 5 Write the mathematical expression for the frequency of torsional vibration.
- 6 Define the following terms.
(i) Over damping (ii) under damping
- 7 Give any two practical cases related to forced vibration.
- 8 Name the factors that affect the critical speed of a shaft.
- 9 Define the following terms related to Governors.
(i) Hunting (ii) Isochronous Governors
- 10 What is the effect of gyroscopic couple in case of ship when it is taking a turn?

Part – B (5 X 16 = 80 marks)

Q 11 is compulsory, from Q 12 onwards answer either (a) or (b)

- 11 A machine of mass 75 kg is mounted on springs of stiffness 1200 kN/m and with an assumed damping factor of 0.2. A piston within the machine of mass 2 kg has a reciprocating motion with a stroke of 80 mm and a speed of 3000 cycles/min. Assuming the motion to be simple harmonic, find: i) the amplitude of the motion of the machine ii) its phase angle with respect to the exciting force, iii) the force transmitted to the foundation and iv) the phase angle of transmitted force with respect to the exciting force. (16)
- 12 a) A horizontal steam engine running at 240 rpm has a bore of 300 mm and stroke 600 mm. The connecting rod is 1.05 m long and the mass of reciprocating parts is 60 kg. When the crank is 60° past its inner dead centre, the steam pressure on the cover side of the piston is 1.125 MPa while that on the crank side is 0.125 MPa. Neglecting the area of the piston rod, determine: i) the force in the piston rod and ii) the turning moment on the crank shaft. (16)

[OR]

- 12 b) The turning moment diagram for a petrol engine is drawn to the following scales: Turning moment, 1 mm = 5 N-m; crank angle, 1 mm = 1° . The turning moment diagram repeats itself at every half revolution of the engine and areas above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270 mm². The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 rpm. (16)

- 15 a) A porter governor has equal arms 200 mm long pivoted on the axis of rotation. The mass of each ball is 3 kg and the mass on the sleeve is 15 kg. The ball path is 120 mm when the governor begins to lift and 160 mm at the maximum speed. Determine the range of speed. If the friction at the sleeve is equivalent to a force of 10 N, find the coefficient of insensitiveness. (16)

[OR]

- 15 b) A motorcycle with rider 260 kg. The CG lies 62 cm above the ground when running straight in vertical plane. Each wheel diameter 62 cm with mass moment of inertia 1 kg-m^2 . The engine rotates 6.2 times faster than the wheels in the same sense. Rotating parts of engine having mass moment of inertia 0.176 kg-m^2 . Determine the inclination of the motor cycle (or) angle of heel required to speeding at 85 kmph, rounding a curve of radius 52m. (16)