University of Mumbai

Examination Second Half 2022

Examinations Summer 2022

1T01425/T.E. (Mechanical) Engineering/(SEM-V)(Choice Base Credit Grading System) R2016

32604/Dynamics of Machinery

Time: Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Sensitiveness of the governor is defined as the ratio of the
Option A:	difference of the maximum and minimum equilibrium speeds to the mean speed
Option B:	sum of the maximum and minimum equilibrium speeds to the mean speed
Option C:	mean speed to the maximum equilibrium speed
Option D:	mean speed to the minimum equilibrium speed
2.	A spring-controlled governor is found unstable. It can be made stable by
Option A:	decreasing the spring stiffness
Option B:	increasing the spring stiffness
Option C:	decreasing the ball mass
Option D:	increasing the ball mass
3.	When the pitching of a ship is upward, the effect of gyroscopic couple acting on it will be
Option A:	to raise the stern and lower the bow
Option B:	to move the ship towards star-board
Option C:	to raise the bow and lower the stern
Option D:	to move the ship towards port side
4.	In an automobile, what is effect on the gyroscopic torque on outer wheels, if the vehicle takes a left turn
Option A:	decreases the forces on the outer wheels
Option B:	does not affect the forces on the outer wheels
Option C:	increases the forces on the outer wheels
Option D:	increases with speed and then decreases
5.	Correction couple is applied when masses are placed arbitrarily and to maintain ________
Option A:	Stable equilibrium
Option B:	Unstable equilibrium
Option C:	Dynamic equilibrium
Option D:	Static equilibrium
6.	Determine natural frequency of a system, which has equivalent spring stiffness of 30000 N/m and mass of 20 kg?
Option A:	48.73 rad/s
Option B:	38.73 rad/s
Option C:	33.73 rad/s

BC33584B094892E4D85A8607F3316CE1

Option D:	35.57 rad/s
7.	Which of the following case represents overdamping?
Option A:	roots are complex conjugate
Option B:	roots are real
Option C:	roots are equal
Option D:	Independent of the equation
8.	Critical damping is the
Option A:	largest amount of damping for which the motion is simple harmonic in free vibration
Option B:	smallest amount of damping for which the motion is simple harmonic in free vibration
Option C:	largest amount of damping for which no oscillation occurs in free vibration
Option D:	smallest amount of damping for which no oscillation occurs in free vibration
9.	In a vibrating system, if the actual damping coefficient is 40 N-s/m and critical damping coefficient is 400 N-s/m, then logarithmic decrement is equal to
Option A:	0.58
Option B:	0.53
Option C:	0.33
Option D:	0.63
10.	Magnification factor is the ratio of ____
Option A:	amplitude of unsteady state vibrations and zero frequency distribution
Option B:	zero frequency deflection and amplitude of steady state vibrations
Option C:	amplitude of steady state vibrations and zero frequency deflection
Option D:	steady state amplitude to the natural frequency of the system

Q2	**Solve any Two Questions out of Three** **20 marks**
A	Explain porter governor with neat sketch also derive an expression for height of a porter governor.
B	What are advantages, disadvantages and causes of vibration
C	A cylinder of diameter D and mass in floats vertically in a liquid of mass density ρ. Find the period of oscillation, if it is depressed slightly released.

Q3	**Solve any Two Questions out of Three** **20 marks**
A	A Porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and the mass of the central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the minimum and maximum speeds and range of speed of the governor.
B	Four masses m_1, m_2, m_3 and m_4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45°, 75° and 135°. Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m.

BC33584B094892E4D85A8607F3316CE1

C	The connecting rod of a gasoline engine is 300 mm long between its centres. It has a mass of 15 kg and mass moment of inertia of 7000 kg-mm^2. Its centre of gravity is at 200 mm from its small end centre. Determine the dynamical equivalent two-mass system of the connecting rod if one of the masses is located at the small end centre.

Q4	**Solve any Two Questions out of Three** **20 marks**
A	Draw the chart of magnification factor vs frequency ratio and explain the significance of magnification factor.
B	Explain the concept of Gyroscopic Couple
C	Derive the equation for critical speed of a light shaft with a single disc without damping.