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KUMARAGURU
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M.E DEGREE EXAMINATIONS: JUNE 2015

Regulation 2014

Second Semester

CAD/CAM

P14CCT201: Mechanical Vibrations

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The torsional stiffness of a circular shaft is [K_1]

   a) Directly proportional to its length
   b) Inversely proportional to its length
   c) Independent of its length
   d) Sequence of its length

2. In single degree low damped forced vibration the force vector polygon approximates a rectangle under vibration. [K_2]

   a) Below resonance conditions
   b) At resonant conditions
   c) Above resonance condition
   d) At zero frequency

3. The spring for vibration isolation in forced system for low damping should be made of [K_1]

   a) metal
   b) Rubber pads
   c) Air spring
   d) Neoprene pads

4. Match the following list [K_2]

List I	List II
P. Continuous relative rotation	1. D' Alembert's principle
Q. Velocity and acceleration	2. Grubler's criterion
R. Dynamic-static analysis	3. Grashoff's law
S. Continuous relative rotation	4. Kennedy's theorem

   a) P-1,Q-2,R-3,S-4
   b) P-3,Q-4,R-2,S-1
   c) P-2,Q-3,R-4,S-1
   d) P-4,Q-2,R-1,S-3

5. Centrifugal pendulum absorber is used to reduce the [K_2]

   a) Centrifugal forces in the rotating system
   b) Torsional vibration of rotating system

c) Vibrating of linear system
d) Transverse vibration

6. Rayleigh,s method for continuous system is used to find [K_2]

a) Highest natural frequency of the system
b) longest natural frequency of the system
c) Any natural frequency of the system
d) Mode shapes of the system

7. A pendulum clock runs 30 minutes fast in 24 hours. It should be corrected by [K_3]

a) Increasing the mass of bob 2%
b) Increasing the length of pendulum by 4%
c) Decreasing the length of pendulum by 4%
d) Decreasing the mass of the bob by 2%

8. A 0.5 Kg mass attached to the end of a light spring elongates it by 0.98 mm. Find the stiffness and natural frequency of the system. [K_4]

a) 15.8Hz
b) 16.0Hz
c) 15.9Hz
d) 16.1Hz

9. In a single degree of freedom damped forced vibration system, the magnification ratio approached the following when frequency ratio is large.

a) Unity
b) Zero
c) Less than Zero
d) More than zero

10. Single degree of freedom system having mass 1kg and stiffness 10kN/m initially at rest is subjected to an impulse force of magnitude 5 kN for 10^{-4}seconds. The amplitude in mm of the resulting free vibration is [K_4]

a) 0.5
b) 1.0
c) 5.0
d) 10.0

PART B (10 x 2 = 20 Marks)

11. What do you understand from the term two degree of freedom? [K_2]

12. Define critical Damping coefficient [K_1]

13. State Rayleigh's method [K_2]

14. What is the purpose of vibration isolator? [K_2]

15. State the significant characteristics of Holzer model. [K_3]

16. What is the purpose of Lagrange Equation? [K_2]

17. State the application of multi degree of freedom [K_3]

18.	What do you mean by coordinate coupling?	[K_2]
19.	Define Stodola's method.	[K_2]
20.	State that Dunkerely's Equation for Shafts	[K_2]

PART C (6 x 5 = 30 Marks)

21.	Derive the step by step function of Laplace transform	[K_2]
22.	Derive the equations of motion of a system using Lagrange's Equation	[K_2]
23.	Explain the concept of vibration absorber with neat sketch. Also state the demerit of dynamic Vibration absorber.	[K_2]
24.	Illustrate the Dunkerley's equation for natural frequency of a shaft carrying several loads	[K_2]
25.	Describe the procedure for Stodola method	[K_3]
26.	Derive the frequency equation of longitudinal vibration for free-free beam with zero initial displacement.	[K_2]

PART D (4 x 10 = 40 Marks)

27.	An electric motor is supported on a spring and a dashpot. The spring has the stiffness 6400N/m and the dashpot offers resistance of 500 N at 4m/sec. The unbalanced mass 0.5 kg rotates at 5 cm radius and total mass of vibratory system is 20kg. The motor runs at 400 rpm. Determine (a) damping factor (b) Amplitude of vibration and phase angle (c) resonance speed and resonance amplitude (d) force exerted by the spring and dashpot on the motor.	[K_4]
28.	Determine natural frequency of multi degree of freedom (3 DOF) system using Matrix iteration Method	[K_3]
29.	Determine natural frequency of three degree of freedom system using Holzer method. (Assume m1=m2=m3=1;k1=k2=k3=1;)	[K_4]
30.	A shock absorber is to be designed so that its overshoot is 10% of the initial	[K_4]

displacement when released. Determine damping factor. If the damping factor is reduced to one half this value, what will be the overshoot?

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