QP Code: RD17001049 Reg. No | | | | | | | | | | | AR 17

GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

B. Tech Degree Examinations, December – 2020

(Seventh Semester)

BMEPE 7033– MECHANICAL VIBRATION

(Mechanical Engineering)

Time: 2 hrs Maximum: 50 Marks

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) (1 x 10 = 10 Marks)

Q.1. Answer ***ALL*** questions [CO#] [PO#]

a. What is the beat frequency of two waves with frequencies of 258 Hz and 262 Hz? CO1 PO1, PO2

(i) 2 Hz (ii) 4 Hz

(iii) 8 Hz (iv) 260 Hz

b. The equation $m\ddot{x} + kx = 0$ represents CO1 PO1, 2,3

(i) Free vibrations (ii) Forced vibrations

(iii)periodically forced vibrations (iii) Free vibrations with viscous damping

c. The maximum acceleration of a particle moving with simple harmonic motion is CO1 PO1, PO2

(i) ω (ii)$\omega.r$

(iii) $\omega^2.r$ (iv) ω^2/r

d. What is the effect of damping on phase angle at resonance frequency? CO2 PO1, PO2

(i) Phase angle increases as damping increases (ii) Damping has no effect on phase angle

(iii) Phase angle increases as damping decreases (iv) None of the above

e. A mass of 2 kg is attached to the end of a spring with a stiffness 0.35 N/mm. The critical damping coefficient of the system will be CO2 PO1,2,3

(i) 1.40 Ns/m (ii) 18.522 Ns/m

(iii) 52.92 Ns/m (iv) 529.2 Ns/m

f. The whirling speed of a shaft coincides with the natural frequency of CO3 PO1, PO2

(i) longitudinal vibrations (ii)transverse vibrations

(iii)torsional vibrations (iv)coupled between torsional vibrations

g. In balancing of single-cylinder engine, the rotating unbalance is _____. CO3 PO1, PO2

(i) completely made zero and so also the reciprocating unbalance (ii) completely made zero and the reciprocating unbalance is partially reduced

(iii) partially reduced and the reciprocating unbalance is completely made zero (iv) partially reduced and so also the reciprocating unbalance

h. Which of the following instruments measure amplitude of a vibrating body? CO3 PO1, PO2

(i) Vibrometers (ii) Seismometer

(iii) Both a. and b. (iv) None of the above

i. The systems having one of their natural frequencies equal to zero are known as CO4 PO1, PO2

(i)definite systems (ii)semi-definite systems

(iii)coupled systems (iv)none of these

j. A shaft having three rotors will have maximum _____ number of nodes CO4 PO1, PO2

(i) no node (ii) one node

(iii) two nodes (iv) three nodes

PART – B: (Short Answer Questions) (2 x 5 = 10 Marks)

Q.2. Answer ***ALL*** questions

		[CO#]	[PO#]
a.	A car having a mass of 1500 kg deflects its spring by 3 cm under its own load. Find the natural frequency of car in vertical direction.	CO1	PO3
b.	State different methods of finding natural frequency of a system	CO1	PO1, 2
c.	What are the various types of damping?	CO2	PO1, 2
d.	Define vibration isolation and State the importance of it.	CO3	PO1, 2
e.	In torsional vibrations, the node is always closer to the rotor with high moment of inertia - Justify	CO4	PO1, 2, 3

PART – C: (Long Answer Questions) (6 x 5 = 30 Marks)

Answer ***ANY FIVE*** questions

		Marks	[CO#]	[PO#]
3.	A harmonic motion is given by $x(t) = 10\sin(30t - \frac{\pi}{3})$mm where t is in seconds and phase angle in radians. Find (i) frequency and the period of motion, (ii) the maximum displacement, velocity and acceleration.	(6)	CO1	PO1, PO2, PO3
4.	A mass is suspended from a spring from a spring system as shown in Fig.2 Determine the natural frequency of the system. k_1 = 5000 N/m, k_2=k_3 = 8000 N/m an m = 25 kg	(6)	CO1	PO1, PO2

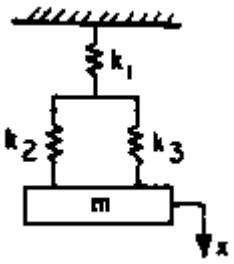

Fig.2

5.	For the system shown in Fig.3, find i) undamped natural frequency ii) critical damping coefficient, C_c iii) If C = $\frac{Cc}{2}$, find the damped natural frequency iv) Determine the logarithmic decrement	(6)	CO2	PO1, PO2, PO3

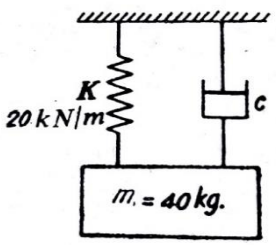

Fig.3

6.	Explain briefly about viscous and Coulomb damping with neat diagrams.	(6)	CO2	PO1, PO2, PO3
7.	A mass of 50 kg suspended from a spring produces a static deflection of 0.017 m and when in motion, it experiences a viscous damping force of 250 N at a velocity of 0.3 m/s. Calculate the periodic time of damped vibration. If the mass is subjected to a periodic disturbing force having a maximum value of 200 N and making 2 cycles per second, find the amplitude of the ultimate motion.	(6)	CO3	PO1, PO2
8.	Explain the working principle of (i) vibrometer and (ii) accelerometer with neat diagrams	(6)	CO3	PO1, PO2
9.	Explain the concept of vibration absorber with a neat diagram and necessary equations.	(6)	CO4	PO1, PO2
10.	Calculate the natural frequency of a shaft of diameter 10 cm and length 300 cm carrying two discs of diameters 125 cm and 200 cm respectively at its ends and weighing 480 kg and 900 kg respectively. Modulus of rigidity of the shaft material may be taken as 1.96×10^{11} N/m^2.	(6)	CO4	PO1, PO2

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