QP Code: RM23MTECH119 | Reg. No | | | | | | | | | | | AY 23

GIET UNIVERSITY, GUNUPUR – 765022

M. Tech (Second Semester) Examinations, May – 2024

MPCSE2020 - Structural Dynamics

(Structural Engineering)

Time: 3 Hrs | Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer all questions	CO#	Blooms Level
a. List out the types of vibration isolation.	CO1	K2
b. Write down the fourier series for periodic loading.	CO1	K2
c. What are all the differences between free and forced vibration?	CO1	K2
d. What is Damping matrix?	CO2	K1
e. State the modal orthogonal conditions with reference to mass and stiffness.	CO2	K2
f. What do you mean by dynamic coupling?	CO3	K1
g. Recommend any two methods of finding natural frequency of multiple degree of freedom system.	CO3	K2
h. Draw a neat sketch used to derive equation of flexural vibration of uniform beams.	CO3	K2
i. Use Rayleigh's method find an expression for fundamental frequency of a continuous beam by taking the shape function $\Psi(x) = (x/L)2$	CO4	K3
j. List out Rayleigh's quotient.	CO4	K1

PART – B **(10 x 5=50 Marks)**

Answer ***ANY FIVE*** questions	Marks	CO#	Blooms Level
2. a. A vibrating system consists of a mass of 5kg, spring of stiffness 120 N/m and a damper with a damping co-efficient of 5 N-s/m. Examine Damping factor, Natural frequency of the system, Logarithmic decrement, The ratio of two successive amplitude, The number of cycles after which the initial amplitude reduces to 25%	5	CO1	K3
b. A weight W is suspended from the mid span of a simply supported beam of span L, flexural rigidity EI and mass per unit length m. If the wire by which the weight w is suspended suddenly snaps. (a) Describe the subsequent vibration of the beam. Neglect damping. (b) Find its deflection expression at the centre	5	CO1	K3
3.a. A block of weight 900 N (moving between vertical guides) is supported by a spring of stiffness 10^6N/m. the block is given an initial displacement of 50 mm with a velocity of 300 mm/sec, determine the period of vibration, natural frequency, amplitude of motion, maximum velocity and maximum acceleration	5	CO1	K3

	of the block. Assuming a damping of 20% and show the logarithmic decrement and the damping coefficient of the system.			
b.	An SDOF system consists of a mass of 20kg, a spring of stiffness 2200N/m and a dashpot with a damping coefficient of 60 N-s/m is subjected to a harmonic excitation of F=200 sin 5t N. Analyse the system for Damping coefficient, Frequency ratio, Steady state Response and phase angle.	5	CO2	K3
4. a.	Determine the natural frequencies and mode shapes of a three storey building having a floor weight 2500kN, 2000kN for the first, second floor respectively. The height of each floor is 3m and EI = 28x1012 Nmm^2	5	CO2	K2
b.	Explain in detail about the free and forced vibration of two degree of freedom systems	5	CO2	K2
5.a.	A three storey frame shown in fig. is subjected to an excitation force of P cosωt at the top level due to steady state vibration. Determine the response at the top level on the basis of consideration of first mode only and first two modes only for ω = 0 and ω = 0.5 p1	5	CO2	K3
b.	Construct the step by step procedure involved in the mode superposition technique for a 3 DOF system	5	CO3	K2
6. a.	Explain some approximate methods for solving MDOF systems	5	CO3	K2
b.	Find out the solution for equation of motion and find out the natural frequency and mode shapes with one end fixed and another end simply supported	5	CO3	K2
7.a.	Determine from first principles, the first three natural frequencies and mode shapes of a simply supported beam subjected to free flexural vibrations	5	CO4	K2
b.	Express in detail the equation of motion by Virtual work method	5	CO4	K3
8. a.	(i) Explain about the free and forced vibration of continuous systems. (ii) List out the applications of virtual work method?	5	CO4	K2
b.	Determine the first two natural frequencies of uniform cantilever beam by Rayleigh – Ritz method. Assume φ(x) = C1x2+C2x3	5	CO4	K3

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