Sanjay Ghodawat University, Kolhapur

2018-19
EXM/P/09/00

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F.Y. M.Tech.
(Structural Engg.)
Course Code – CSE505
Date:
21 Dec 2018 & Today

School of Technology

Course Title: Structural Dynamics
Examination: ESE

Department – Civil Engineering
Semester – I
Time: 10:30 to 1:30 pm **Max Marks: 100**

Instructions:
1) Use of **non-programmable** calculators are allowed
2) Figures to the right indicates **full marks**
3) All Questions are **compulsory**

Q.1	a)	What is Dynamic magnification Factor? Explain how it depend on damping ratio and frequency ratio.	07	Blooms Level L2	CO1
	b)	An automobile whose weight is 200N is mounted on four identical springs as shock absorbers. Due to weight of automobile, spring gets shortened by 0.25m. Each shock absorber has a damping force of 0.5N at the velocity of 50mm/s. The car is placed on rigid platform which moves vertically at resonant speed, having amplitude of 10mm.Find the amplitude of vibration of the automobile.	08	L4	CO1
		OR			
	b)	Compute the natural frequency in the side sway for the frame as shown in Fig.1.If the initial displacement is 20mm and initial velocity is 20m/s, compute the amplitude. Write the expression for displacement. Damping is 10% of critical. Cross-sectional dimension of columns and beam is 230mm X 300 mm: E= 22.4GPa.	08	L4	CO1

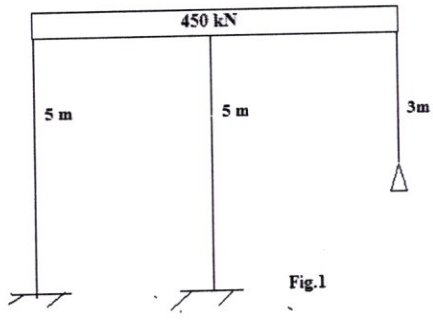

Fig.1

Q.2		Using Duhamel integral, determine the maximum response of SDOF system having mass of 1000 kg and spring stiffness of 100 KN/m	15	L4	CO2

subjected to a rectangular pulse load having an intensity of 10 KN as shown in Fig.2

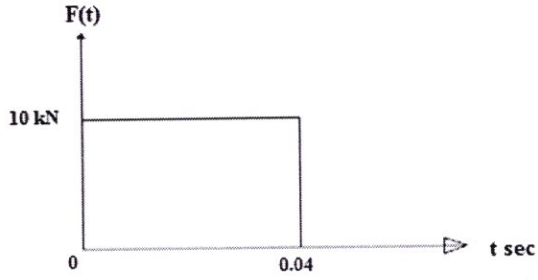

Fig.2

Q.3	a)	Explain time domain and frequency domain approach of analysis	05	L2	CO3
	b)	Evaluate response of a SDOF oscillator subjected to a periodic loading shown in Fig.3 using Fourier series analysis.	10	L6	CO3

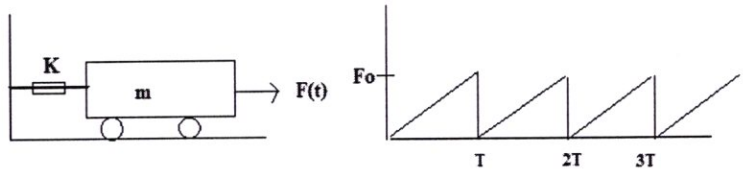

Fig. 3

Q.4		For two storied shear building shown in Fig.4, compute the fundamental natural frequency and plot the modes. Neglect the axial deformation in all structural elements. Given EI= 5 x 10^6 Nm^2, m = 500 X 10^3 Ns^2/m, story height = 3m, span = 5 m.	15	L6	CO4

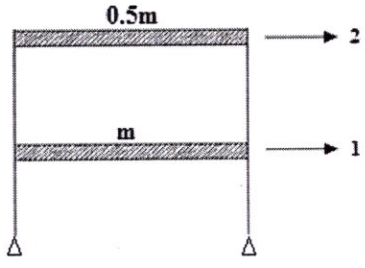

Fig.4

Q.5		Following flexibility matrix were obtained for the shear frame shown in Fig.5. Compute the natural frequencies and corresponding eigen vector by Stodola -Vianello procedure.	20	L6	CO5

$$[f]=\frac{1}{K}\begin{bmatrix}1 & 1 & 1\\ 1 & 2 & 2\\ 1 & 2 & 3\end{bmatrix}$$

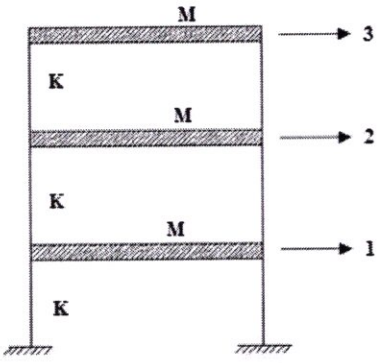

Fig.5

OR

	a)	Explain the significance of fundamental mode analysis. Mention different methods of fundamental mode analysis. Explain any one in detail.	08	L2 CO5
	b)	Derive the expression for frequencies and mode shapes of a beam in flexure. Using the expression, find the first three frequencies and mode shapes of a uniform simply supported beam.	12	L2 CO5
Q.6		A simply supported beam of span 5m carried a UDL of 20 kN/m including its self-weight. Determine first three frequencies and mode shapes of the beam modelled as a distributed parameter system. If the beam is modelled as a lumped mass at center, what will be the frequency? Comment on the fundamental frequency got from the two approaches.	20	L4 CO6

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