Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

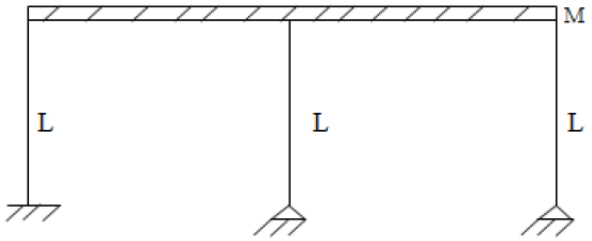
End Semester Examination, Jan 2020

Programme Name: M.Tech. Structural Engineering **Semester : I**
Course Name : Structural Dynamics **Time : 03 hrs**
Course Code : CIVL 7006 **Max. Marks : 100**
Nos. of page(s) : 2
Instructions: Answer all questions of Section A, B & C

SECTION A

S. No.		Marks	CO
Q 1	What is D' Alemberts principle? Explain how the principle is employed in vibration problems.	5	CO1
Q 2	Explain Duhamel's integral in evaluating response of a structure.	5	CO1
Q 3	What is the orthogonality criteria for normal modes?	5	CO1
Q 4	Derive the expression for dynamic response of continuous system by Rayleigh's method	5	CO1
Q 5	What is logarithmic decrement?	5	CO2
Q 6	Explain methods to evaluate damping.	5	CO1

SECTION B

Q 7	Calculate the natural angular frequency in side sway for the frame of weight 30 MN shown in the Fig. and also the natural period of vibration. If the initial displacement is 25 mm and the initial velocity is 25 mm/s, what is the amplitude and displacement at t=1 sec? Take EI=12.5 GN-m2. Length of column member is 1.0m 	10	CO2
Q 8	Explain Impulse response of SDOF system with example (virtual Lab)	10	CO4
Q 9	A damped free vibration test is conducted to determine the dynamic properties of a one storey building. The mass of the building is 8000 kg. Initial displacement of the building is 0.6 cm. Maximum displacement on first cycle is 0.5cm and period of this displacement is 1.5s. Determine the i. effective weight, ii. undamped frequency, iii. logarithmic decrement,	2 + 4 +4= 10	CO2

Q 10	From the previous problem, explain i. damping ratio, ii. damping coefficient, iii. damped frequency and iv. Amplitude after 5 cycles.	**2+2+2 +4= 10**	**CO2**
Q 11	With help of example, describe torsional response of building. (virtual Lab)	**10**	**CO4**
SECTION-C			
Q 12	Explain the step by step procedure of the analysis of a multi degree of freedom system by the method of mode super position. OR Derive an expression for the force transmitted to the foundation and phase angle for a damped oscillator idealized as a MDOF system subjected to harmonic loading.	**20**	**CO3**