Ref: EX/CE/T/424B/2017(Old)

B.E. Civil Engineering 4th Year 2nd Semester Examination (old) 2017

Subject: Structural Dynamics **Time: Three Hours** **Full Marks: 100**

Part 1

Note: Use separate answer script for each part

Answer Any Two(2)

1. (a) Obtain the expression for the Frequency Response Function (FRF) of a SDOF system.
   (b) Express amplitude and phase of the FRF as a function of frequency and plot the same.
   (c) Prove that the amplitude of a SDOF has its peak when $\omega/\omega_n = (1-2\xi^2)^{1/2}$ where ξ is the damping ratio.
   (d) A Machine is connected to its base through a spring and a damper and is subjected to a harmonic force F_0. Obtain the expression for the transmitted force F_{TR} from the machine to its base. (4 + 7 + 6 + 8)
2. (a) Obtain the expression of Impulse Response of a SDOF system at various time instances. State clearly the assumptions undertaken.
   (b) Using Convolution Theorem obtain the response of a SDOF system subjected to a shock shown in figure 1. (10 + 15)
3. (a) A piping system experiences resonances when the pump supplying power to the system operates at 500 rev/min. When a 5 kg absorber tuned to 500 rev/min is added to the pipe the system natural frequencies are measured as 380 and 624 rev/min. What is the natural frequency of the piping system and its equivalent mass.
   (b) A 35 kg flow monitoring device is placed on a table in a laboratory. A pad of stiffness 2×10^5 N/m and damping ratio 0.08 is placed between the apparatus and the table. The table is bolted to the laboratory floor. Measurements indicate that the floor has a steady state vibration amplitude of 0.5 mm at a frequency of 30 Hz. What is the amplitude of acceleration of the flow measuring device. (15 + 10)

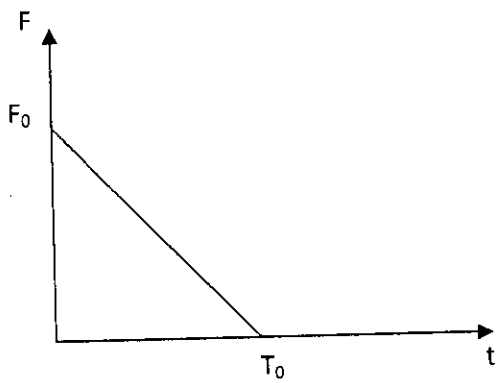


Figure 1

B.E. Civil Engineering - Fourth Year - Second Semester (Old) EXAMINATION, 2017

Structural Dynamics

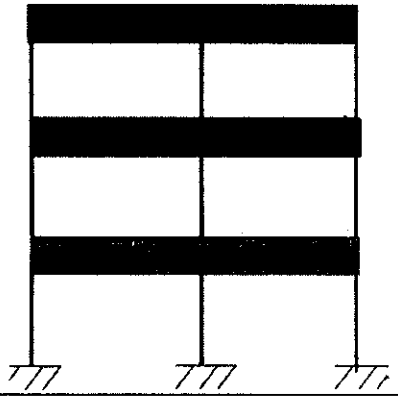
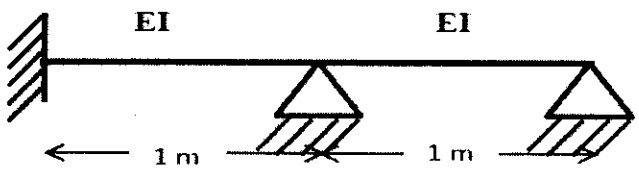
PART-II

Time: Three Hours

Full Marks
(50 marks for each p

Use a separate Answer-Script for each part

[IS1893 is allowed]

No. of questions	Part II (Answer Any Two of the following questions.)	Mark (2X25=
1	Consider a two bay three storey R.C. framed building as shown in figure1. The floor is rigid. The mass at the first floor and at roof are 75 kN/m2 and 50 kN/m2 respectively. Area of floor is 10 m2 The column size at ground floor is 350X350, at first floor is 250X250 and 2nd floor is 450X450 respectively. Floor to floor height is 3m in each floor. The building is located at Delhi. Determine the storey stiffness, frequencies and mode shapes. Compute also the storey shears and floor forces. Assume M25 grade of concrete. 	25
2 (a)	Write a short note on response spectra.	5
(b)	Consider the following figure a uniform beam with one end fixed against translation and rotation. The beam is divided into two equal segments. Determine the first two natural frequencies and corresponding mode shapes. Use the lumped mass method in order to simplify numerical calculation. 	20

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Structural Dynamics

PART-II

Time: Three Hours

Full Marks 100
(50 marks for each part)

Use a separate Answer-Script for each part

[IS1893 is allowed]

No. of questions	Part II (Answer Any Two of the following questions.)	Marks (2X25=50)
3 (a)	Derive the equation of motion in free vibration of a flexural uniform beam.	10
(b)	Determine the natural frequencies and mode shape for uniform beam with both end simply supported.	15