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Question Paper Code: 20282



B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Seventh Semester

Civil Engineering

CE 6701 — STRUCTURAL DYNAMICS AND EARTH QUAKE ENGINEERING

(Regulations 2013)

(Common to PTCE 6701 — Structural Dynamics and Earth Quake Engineering for
B.E (Part-Time) — Fifth Semester — Civil Engineering - Regulations 2014)

Time: Three hours

Maximum: 100 marks

Answer for ALL questions.

PART A — (10 x 2 = 20 marks)

1. Explain De Alembert's principle

According to Newton's law $F = ma$

- D'Alembert's principle which state that a system may be in dynamic equilibrium by adding to the external forces, an imaginary force, which is commonly known as the inertia force.

$$F - ma = 0$$

 $F \rightarrow$ Real Force

 $ma \rightarrow$ Imaginary Force


(a). Spring Mass System



(b). Dynamic equilibrium

2. Brief about the SDOF system and free body diagram.

- ✓ At any instant of time, the motion of this system can be denoted by single coordinate (x in this case).
- ✓ It is represented by a rigid mass, resting on a spring of stiffness ' k ' and coupled through a viscous dashpot (representing damping) having constant ' c '. Here, the mass ' m ' represents the inertial effects of damping (or energy dissipation) in the system.
- ✓ Using the dynamic equilibrium relation with the inertial force included, according to D'Alembert's principle, it can be written as

$$F_i + F_D + F_s = P(t)$$

(Inertial Force) (Damping Force) (Elastic Force) (Application Force)

This gives

- ✓ $m\ddot{x} + c\dot{x} + kx = P(t)$ $x, \dot{x}, \ddot{x}$ respectively denote the displacement, velocity and acceleration of the system, $P(t)$ is the time dependent force acting on the mass.

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