Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech.**
PECI5407

8th Semester Regular Examination 2017-18
STRUCTURAL DYNAMICS & EARTHQUAKE ENGINEERING
BRANCH : CIVIL
Time : 3 Hours
Max Marks : 70
Q.CODE : C109

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions : **(2 x 10)**

a) What do you mean by *natural frequency of vibration*?
b) Differentiate between *repetitive motion* and *periodic motion*.
c) What do you mean by *deterministic* and *non deterministic load*?
d) Define *storey shear*.
e) What do you mean by *hypocenter of earthquake*?
f) What is *forced vibration*?
g) Differentiate between *intensity* and *magnitude* of earthquake.
h) State the form of *Duhamel integral* for a damped system.
i) What is meant by *critical damping*?
j) During an earthquake, which type of body wave reaches the earth surface earliest?

Q2 a) A body of mass 'm' is connected with three springs of stiffness k_1, k_2 and k_3. Find the fundamental frequency of the system when the first two springs are connected in parallel to each other and the third one is connected in series to it. **(3)**

b) Derive the equation of motion for longitudinal vibration of a bar. **(7)**

Q3 a) Find the natural frequency of a cantilever beam using Rayleigh's method due to its weight only. **(7)**

b) The amplitude decay was recorded for an impulse loading on the soil surface. The initial amplitude is 0.18 mm. The amplitude at 10 cycles of decay is 0.9 mm. Determine the damping in the soil. **(3)**

Q4 A SDOF system is defined by the following parameters, mass=4 kg, stiffness=64 N/m. The damping in the system has a resistance of 4 N at a velocity of 1 m/s. Determine the damping factor, natural frequency of damped vibration, logarithmic decrement and the ratio of two consecutive amplitudes. **(10)**

Q5 A Cosine harmonic motion has following parameters: **(10)**

amplitude = 10 cm
circular frequency = 30 rad/sec.
phase angle = 60° lagging

State the equation of motion and determine the cyclic frequency, period of motion and acceleration.

Q6 A machine foundation can be idealized as a mass spring system. This foundation is subjected to a force that can be given as $Q\ (kN) = 35.6 \sin (wt)$. Given *f*=13.33 Hz, weight of the vibrating system = 178 kN and spring constant = 70000 kN/m. Determine the maximum and minimum dynamic force transmitted through the base. **(10)**

Q7 The mass and stiffness matrices of a dynamic system are given by $[m] = \begin{bmatrix} 3 & 0 \\ 0 & 2 \end{bmatrix}$ and $[k] = \begin{bmatrix} 4 & -1 \\ -1 & 2 \end{bmatrix}$. Neglecting damping, calculate the genralised mass matrix as well as modal matrix of the system. **(10)**

Q8 Write short answer on any TWO : **(5 x 2)**

a) Half power band width
b) Transient response
c) Continuous system
d) Logarithmic decrement