**Karunya University**

**(Karunya Institute of Technology and Sciences)**

(Declared as Deemed to be University under Sec.3 of the UGC Act, 1956)

**Supplementary Examinations – June 2016**

**Subject Title:** **Structural Dynamics Time : 3 hours**

**Subject Code: 14CE3005 Maximum Marks: 100**

**Answer ALL questions (5 x 20 = 100 Marks)**

1. a. A vibrating system consists of a mass of 500kg and a spring of stiffness 1200N/m. Determine i) Natural frequency of the system, ii) Time period iii) critical damping coefficient iv) damped natural frequency if damping ratio is 0.05%. (10)

b. A two degree of freedom system has two masses m1= 1000kg and m2=750kg. The stiffness of the two floors are 5000N/m. Estimate the natural frequency of the system. (10)

**(OR)**

2. A Platform of weight 2000kg is being supported by four equal columns that are clamped to the foundation as well as to the platform. Experimentally it has been determined that the static force of F= 2000kg applied horizontally to the platform produced a displacement of mm. Damping in the structures is 5%. Determine i)Undamped Natural Frequency ii) Damping coefficient, iii) Logarithmic decrement, iv) the number of cycles and the time required for the amplitude of motion to be reduced from an initial value of 2.5mm to 0.25mm

3. a. An undamped simple oscillation shown in figure is acted by a periodic force shown in figure. Determine the response of the system. (10)

K

X

t

M

F (t)



F(t)

t

T

3T

2T

b. Determine the dynamic response of a tower subjected to blast loading. The idealization of the structure and the first loading are shown. Neglect damping. (10)

F(t)

1200

0

0.02

0.04

0.06

t in sec

F (t)

W=30kN

K=100kN/m

**(OR)**

4. a. Find the fundamental frequency of a uniform cantilever of length ‘*l*’ and a mass ‘m’ by Rayleigh method. Take the shape function as ψ(x) = 1- (cos πx/2*l*). (10)

b. Find the natural frequency of a simply supported beam of length ‘*l*’ and mass ‘m’ using Rayleigh’s method. Assume deflection curve as Ф (x) = y. sin (πx/*l*). (10)

m

EI, mb

L/2

L/2

5. A simply supported beam of length ‘*l*’ and of constant cross section is executing simple harmonic motion. Find the values of natural frequencies of first 3 modes and sketch the mode shape.

[P.T.O]

**(OR)**

6. a. State and prove the orthogonal property of normal modes. (10)

b. A simply supported beam of span 8m is subjected to a concentrated force of 700 N applied suddenly at a point 2m from the left end. Mass of the beam is 750kg/m and EI=30x106Nm2. Determine the response by considering first two modes only. (10)

7. Calculate the first mode shape and frequency of the three storeyed building shown in figure using Stodola method. The Flexibility matrix is as follows.

m =1.5

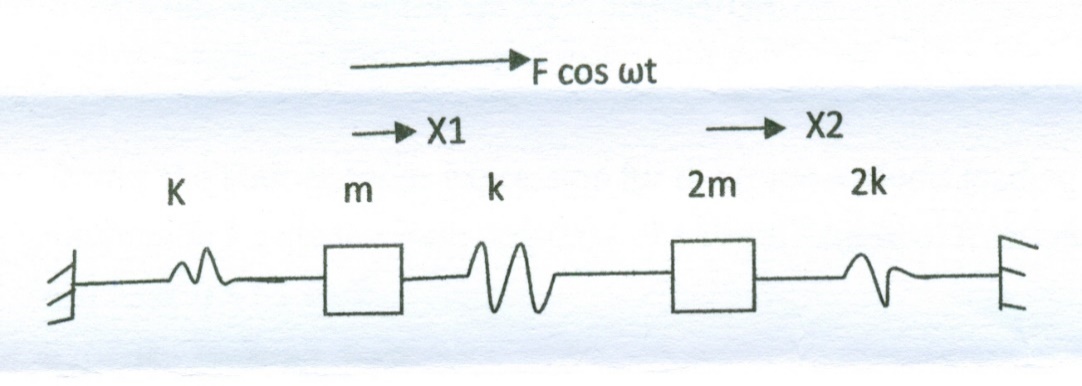
m = 2

m =1



**(OR)**

8. Explain the concept of the shear building. Determine the modes of vibration and steady state response of the system shown.



9. **Compulsory:**

Write short notes on: a. Central difference method b. Wilson θ method.