**Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_**

****

**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

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

**Supplimentary Examnination – June 2017**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Code :** | **14CE3005** | **Duration :** | **3hrs** |
| **Sub. Name :** | **STRUCTURAL DYNAMICS** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Q. No. | Sub Div. | Questions | Course  Outcome | Marks |
| 1. | a  b | Develop the equation of motion for damped free vibration of a SDoF system and hence explain the under damped critically damped and overdamped sytem with neat sketch  A free vibration test is conducted on an empty elevated water tank. A cable attached to the tank applies a lateral horizontal force of 73 kN and pulls the tank horizontally by 50mm. The cable is suddenly cut and the resulting free vibration is recorded. At the end of four complete cycles, the time is 2.0 sec and the amplitude is 25mm compute the following:  a)damping ratio b)natural period of undamped vibration  c) stiffness d). weight e).damping coefficient f).number of cycles required for the displacement amplitude to decrease to 5mm. | CO1  CO1 | 10  10 |
| (OR) | | | | |
| 2. | a  b  c | Explain Logarithmic Decrement  A spring mass has a natural frequency 24Hz. If spring stiffness is reduced to 2 kN/m, the frequency is altered by 50%. Determine the mass and stiffness of the original system.  For a SDOF system having mass 20 kg and spring constant 24 kN/m, the amplitude decreases to 25% of the initial value after 6 consecutive cycles. find the absolute damping of the system. | CO1  CO1  CO1 | 3  7  10 |
| 3. | a  b | Find the natural frequencies and the modes of vibration for the sysem shown in Figure    Using Duhamel’s integral derive an expression for the response of an undamped single degree of freedom system subjected to a rectangular impulsive load of ‘p0’ acting over a period of t1. Also determine the dynamic magnification factors for displacement at t > t1 and t ≤ t1.  p    p0  t  t1 | CO1  CO1 | 10  10 |
| (OR) | | | | |
| 4. | a  b | A cantilever beam is to be modeled by a mass-less uniform bar to which are attached two lumped masses representing the mass of the original system . Determine the natural frequencies and the natural modes for free lateral vibration.    Develop the equation of motion for undamped forced vibration of a 2 DOF system and hence explain the concept of vibration absorber. | CO1  CO1 | 10  10 |
| 5. | a  b | Prove that the vibration modes are orthogonal.  Determine the first two natural frequencies of a uniform cantilever beam by Rayleigh Ritz method by taking | CO2  CO2 | 5  15 |
|  |  | (OR) |  |  |
| 6 |  | Determine the natural frequencies and mode shapes of the three storey shear building shown in Fig. M1, M2 & M3 are lumped masses, and k1, k2 & k3 are storey stiffnesses. | CO2 | 20 |
|  |  |  |  |  |
| 7. | a  b | Find the response in longitudinal undamped forced vibration of a uniform bar fixed at one end and subjected to a sinusoidal axial force at the other end  Obtain the expression for a uniform beam subjected to free flexural vibration and hence obtain the first three natural frequencies and mode shapes of a cantilever beam subjected to free flexural vibrations | CO1  CO1 | 10  10 |
| (OR) | | | | |
| 8. | a  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 750 kg/m & EI = 30 x 106 Nm2. Determine the response by considering first two modes only.  Determine the first two natural frequencies of a uniform cantilever beam by Rayleigh-ritz method. Assume ø(x)= C1x2 +C2x3 Compare the fundamental frequency with that of exact solution. | CO1  CO1 | 10  10 |
|  | | **Compulsory**: |  |  |
| 9. | a  b | Find the response of a two degree of freedom system whose mass and Stiffness  Matrices are given by the following.  and  The forcing function .The system starts at rest. Find its response by Central Difference method. Use time step as 0.28 sec  Explain the step by step procedure for the solution of equilibrium equation in dynamic analysis using Newmark Beta method | CO2  CO2 | 14  6 |