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



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

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

**End Semester Examination – April / May – 2017**

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| **Code :** | **14CE2032** | **Duration :** | **3hrs** |
| **Sub. Name :** | **BASICS OF DYNAMICS AND ASEISMIC DESIGN** | **Max. marks :** | **100** |

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

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| Q. No. | Sub Div. | Questions | Course  Outcome | Marks |
| 1. | a. | Sketch a spring, mass, damper system. | CO1 | 1 |
| b. | State D’Alembert’s principle. | CO1 | 1 |
| c. | Enumerate the difference between static and dynamic load. | CO1 | 2 |
| d. | Define natural frequency and time period. | CO1 | 2 |
| e. | Determine the natural frequency and natural period of the system consisting of a mass of 100 kg attached to a horizontal cantilever beam through the linear spring k2. The cantilever beam has a thickness of 0.8cm and a width of 1.2cm. E=2.1 x 105N/mm2 , L=70cm and k=10kg/cm. | CO1 | 14 |
| (OR) | | | | |
| 2 | a. | What is meant by degree of freedom? | CO1 | 2 |
| b. | A one kg mass is supended by a spring having a stiffness of 1N/mm. Determine the Natural frequency of the system. | CO1 | 4 |
| c. | List the various dynamic loads and draw its loading pattern. | CO1 | 4 |
| d. | Find the equivalent stiffness of the system shown in the figure. Take K1=k2= 2500 N/m and K3 = 3500N/m.  K1 k3  K2 | CO2 | 10 |
| 3. | a. | What is the difference between free and forced vibration? | CO1 | 2 |
| b. | What is meant by logarithmic decrement? | CO1 | 2 |
| c. | Define damping ratio. | CO1 | 2 |
| d. | A vibrating system consisting of a weight of 1000 kN and a spring stiffness of 80 kN/m is viscously damped so that the ratio of two consecutive amplitudes is 1 to 0.85. determine a) logarithmic decrement, b) natural frequency, c)damping ratio, d) damping coefficient and e) damped natural frequency. | CO1 | 14 |
| (OR) | | | | |
| 4. | a. | List the three forces that resist the exciting force F(t). | CO1 | 2 |
| b. | How is critical damping calculated? | CO1 | 2 |
| c. | To solve the equation of motion for a damped free vibration system, what is the solution form assumed. | CO1 | 2 |
| d. | A SDOF system consists of a mass of 400kg and a spring stiffness of 300kN/m. By testing it was found that a force of 100N produces a relative velocity 12 cm/s. Find a) Damping ratio b) logarithmic decrement , c) ratio of two consecutive amplitudes. | CO1 | 14 |
| 5. | a. | Sketch the displacement plot for an undamped system and mark the amplitude and time period. | CO1 | 2 |
|  | b. | What is meant by steady state response? | CO1 | 2 |
|  | c. | What is dynamic amplification factor? | CO1 | 2 |
|  | d. | A SDOF system consists of a mass of 20kg, a spring of stiffness 2200 N/m and a damping coefficient of 60Ns-m is subjected to a harmonic excitation of F=200 sin 5t. Calculate the steady state response. | CO1 | 14 |
| (OR) | | | | |
| 6. | a. | What is meant by response spectrum? Draw the response spectrum curve as per IS1893:2002. | CO2 | 3 |
|  | b. | The total height of a steel frame building is 12m. What will be its time period? | CO2 | 3 |
|  | c. | A generator of 0.8 ton weight is placed on a concrete plank of width 450mm and length 2 m and thickness 100mm. Find the static and dynamic deflection of generator running at 1850 rpm. Use M20 concrete. Assume damping ratio as 5% of critical. | CO1 | 14 |
| 7. | a. | Differentiate magnitude and intensity of earthquake. | CO2 | 2 |
|  | b. | What is meant by strong column- weak beam concept? | CO2 | 2 |
|  | c. | Mention the types of faults. | CO2 | 2 |
|  | d. | Determine the natural frequency and mode shapes of the two degree of freedom system shown in figure  K 2m k m | CO2 | 14 |
| (OR) | | | | |
| 8. | a. | List the various structural control methods available. | CO3 | 2 |
|  | b. | Explain the concept of Base Isolation. | CO3 | 4 |
|  | c. | For a two storey shear building with the following data determine a) the normalized modal shapes of vibration, b) verify the orthogonality conditions between the modes. m1= 25000 kg, m2 = 11800 kg, a11= 1.00, a21= 1.263, a12 = 1.00 a22 = -1.629. | CO2 | 14 |
|  | | **Compulsory:** |  |  |
| 9. | a. | Discuss based on codal provisions how special confinement is to be provided in the columns. | CO3 | 6 |
|  | b. | A four storey RC school building is located in Delhi with the following data  Plan dimensions - 8.0 m  Storey height - 3.0m  Weight of I, II and III floors- 1150kN  Weight of terrace – 800kN  The structure is resting on hard soil. Determine the total base shear and lateral loads at each floor level for 5% of damping using seismic coefficient method. | CO2 | 14 |