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



**End Semester Examination – Nov/Dec – 2017**

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| **Code :** | **14CE3005** | **Duration :** | **3hrs** |
| **Sub. Name :** | **STRUCTURAL DYNAMICS** | **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. | Recall the D Alembert’s principle? Explain how the principle is employed in vibration problems. | CO1 | 8 |
| b. | 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. | CO2 | 12 |
| (OR) | | | | |
| 2. | a. | 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 i. logarithmic decrement, ii. natural frequency, iii. damping ratio, iv. damping coefficient and v. damped natural frequency. | CO2 | 12 |
| b. | Derive the equation of motion for the vibration of a SDOF system for ξ>1. | CO2 | 8 |
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| 3. | a. | A machine of weight 1,000 kg. is mounted on a steel beam of negligible weight at centre. The rotor in the machine generates a harmonic force of 3,000 kg. at a frequency 60 rad/sec. Assume 10% damping, calculate amplitude of motion of machine, force transmitted to supports and phase angle. Span of beam 3m, E – 2 x 105 Mpa and I of beam 5000 cm4. | CO2 | 12 |
|  | b. | Compare the decay curves for various types of damping. | CO1 | 8 |
| (OR) | | | | |
| 4. | a. | Explain how the following arbitrary periodic loading is converted into simple periodic loadings. | CO1 | 12 |
|  | b. | Derive an expression for the force transmitted to the foundation and phase angle for a damped oscillator idealized as a SDOF system subjected to harmonic force. | CO1 | 8 |
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| 5. | a. | Calculate the first three frequencies of axial vibration of a bar fixed at one end. | CO2 | 15 |
|  | b. | Derive the orthogonality condition of natural modes of vibration in axial direction. | CO1 | 5 |
| (OR) | | | | |
| 6. |  | Determine the first two frequency by Rayleigh-ritz method ,  assuming | CO2 | 20 |
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| 7. |  | For the multistory building shown in fig.5. Obtain frequencies and modes of vibration using Stodolla’s method. Assume *m* = 5 x 104 kg, k= 5 x 104 kN/cm.  m/2    2k 2k    m  2k 2k  2m  2k 2k | CO2 | 20 |
| (OR) | | | | |
| 8. | a. | 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 AND EI = 30 x 106 Nm2. Determine the response by considering first two modes only. | CO3 | 10 |
|  | b. | 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. | CO2 | 10 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | 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. | CO3 | 12 |
|  | b. | Explain the step by step procedure for the solution of equilibrium  equation in dynamic analysis using Newmark Beta method. | CO3 | 8 |

ALL THE BEST