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



**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **18CE3012** | **Duration :** | **3hrs** |
| **Sub. Name :** | **STRUCTURAL DYNAMICS** | **Max. marks :** | **100** |

**ANSWER ANY FIVE QUESTIONS (5 x 16 = 80 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | 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 1.2 cm. E=2.1 x 106 kg/cm2, L=70 cm and k= 10kg/cm. | CO3 | 6 |
| b. | A platform weighing 7 x 102 N is supported on four columns. The columns are identical and clamped at both ends. It has been determined experimentally that a force of 1.75 x105 N horizontally applied to the platform produces a displacement of 2.54mm, Damping is 5% of critical damping. Determine the following, i) undamped natural frequency, ii) absolute damping coefficient, iii) logarithmic decrement. | CO3 | 10 |
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| 2. | a. | Derive the Fourier series expression for the given periodic loading function and write the expression for the response of a SDOF system.  -1.5  F(t)  1.5  T in sec  0.5 1.0 1.5 2.0 | CO4 | 12 |
| b | A SDOF spring-mass damper system is subjected to a harmonic excitation . the Amplitude at resonance is found to be 30mm and 15mm at a frequency 0.7 times the resonant frequency. Determine the damping ratio. | CO1 | 4 |
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| 3. | a. | For a two storey shear building with the following data determine i) the normalized modal shapes of vibration, ii) verify the orthogonality conditions between the modes. m1= 25000 kg, m2 = 12000 kg, a11= 1.00, a21= 1.263, a12 = 1.00 a22 = -1.629. | CO2 | 6 |
| b. | A two storey building having a floor weight 1500kN and 800kN, for the first and second floor respectively. The height of each floor is 3m and EI = 30x1012 Nmm2 . Analyze the natural frequencies and mode shapes. | CO3 | 10 |
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| 4. | a. | Derive the natural frequencies of a simply supported beam subjected to transverse vibration and write the general solution for response of the problem. | CO3,CO4 | 8 |
| b. | The base of a cantilever beam undergoes a pulsating motion ÿsinωt. Determine the response of the cantilever beam. | CO4 | 8 |
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| 5. | a. | Find the response of a two degree of freedom system whose mass and Stiffness matrices are given by :  and    The forcing function .The system starts at rest. Find its response by Central Difference method. Use time step as 0.3 sec. | CO5 | 12 |
| b. | Explain the step by step procedure for the solution of equilibrium  equation in dynamic analysis using Wilson θ method. | CO5 | 4 |
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| 6. |  | Determine the natural frequencies and mode shapes for a framed structure with three floors. The mass in each floor is’m’and the floor is considered to be absolutely rigid. The stiffness in each level are k1=3k, k2=k3= 2k. Use Stodola’s method. | CO3 | 16 |
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| 7. | a. | Derive the expression for response of an undamped SDoF system subjected to harmonic excitation. | CO4 | 8 |
| b. | Determine the steady state response of a SDoF system subjected to a rectangular pulse of force Po upto td, ‘0’ after td. Use Duhamel integral. | CO4 | 8 |
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| **COMPULSORY QUESTION (1 x 20 = 20 Marks)** | | | | |
| 8. | a. | Explain the concept of tuned mass damper with suitable equations. | CO6 | 10 |
| b. | “Mode Shape of the buildings affects the response of the structure subjected to seismic forces”Justify the statement with reference to codal provisions. | CO6 | 10 |