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



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

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Code :** | **17CE3002** | **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. | Determine the natural frequency of the simply supported beam shown in figure. The beam is 100mm wide and 10 mm deep  K=1000N/m  M -300kg  70 mm    E=2.1 \*105N/mm2 | CO1, CO3 | 6 |
| b. | 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 i. Damping ratio ii. logarithmic decrement, iii. ratio of two consecutive amplitudes | CO3 | 14 |
| (OR) | | | | |
| 2. | a. | Explain how the following arbitrary periodic loading is converted into simple periodic loadings  -1.5  F(t)  1.5  T in sec | CO1 | 10 |
| b. | 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 | CO4 | 10 |
| 3. | a. | Determine the natural frequency and mode shape of a two storey shear building with the following data  m1= 800kg, m2 =570kg, k1= 1900kN/m, k2 =1100 kN/m | CO3 | 10 |
|  | b. | 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= 24000 kg, m2 = 11500 kg, a11= 1.00, a21= 1.263, a12 = 1.00 a22 = -1.629. | CO3 | 10 |
| (OR) | | | | |
| 4. | a. | Develop the equation of motion for undamped forced vibration of a 2 DOF system and hence explain the concept of vibration absorber | CO2 | 10 |
|  | b. | Determine the natural frequencies and mode shapes for the system shown below.  C:\Users\1625\Desktop\im.jpg | CO3 | 10 |
| 5. | a. | For the multistory building shown in fig. 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 | CO3 | 14 |
|  | b. | Explain why Dunkerleys method under estimates the fundamental frequency. | CO5 | 6 |
| (OR) | | | | |
| 6. | a. | Determine the first two frequency by Rayleigh-ritz method, assuming | CO5 | 14 |
|  | b. | Discuss briefly on the Jacobi diagonalization method | CO5 | 6 |
| 7. | 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. | CO4 | 10 |
|  | b. | Derive the equation of motion for undamped free longitudinal vibration of a uniform bar and hence obtain the solution for the bar fixed at the left end and carrying a concentrated mass ‘M” at the right end. | CO1 | 10 |
| (OR) | | | | |
| 8. | a. | A simply supported beam of mass “”per unit length, length “L” and flexural rigidity “EI” is carrying a concentrated mass “ M” at the middle span of the beam. Determine its fundamental frequency by Rayleigh’s method | CO3 | 10 |
|  | 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. | CO5 | 10 |
|  | | **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 | CO6 | 12 |
|  | b. | Explain the step by step procedure for the solution of equilibrium equation in dynamic analysis using Newmark Beta method. | CO6 | 8 |

ALL THE BEST