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T-2 Examination –October 2019

B. Tech. 7th Semester (Civil Engineering) & M. Tech. 1st Semester (Structural Engineering)

Course Code: 11M1WCE112 Max. Marks: 25

Course Name: *Structural Dynamics*

Course Credit: 03 Max. Time: *90 Minutes*

Note: All questions are compulsory. Carrying of mobile phone during examination will be treated as case of unfair means. Assume any missing data.

Q.1 A simply supported beam, at its center a machine having weight W = 8000 kg. The beam is made of two standard ISMB 200 sections (Thickness of flange and web are 10 mm and 6 mm, respectively; width of flange and depth of section are 100 mm and 200 mm, respectively) with a clear span L= 4 m and the geometric details of section are shown in Figure 1. The motor runs at 200 rpm and it's rotor weight of 25 kg is out of balance at an eccentricity of e = 5.0 mm. Neglect the weight of beam support system. What will be the amplitude of the steady state response if the equivalent viscous damping for system is assumed 10 % of the critical damping? [6]

Q.2 Develop an expression for the deformation response function for a damped single degree of freedom system having time dependent force f(t)= f_o cos (wt). Where forcing frequency (w) is equal to natural frequency of system and initially the system is in rest. [6]

Q.3 Develop the expression for deformation response factor and phase angle for undamped and damped system exited by harmonic excitation and draw the qualitative expressions for same. [6]

Q.4 Develop an expression for variation of deformation response amplitude with number of cycles for damped single degree of freedom system. If the is exited by a harmonic force f(t)= f_o cos (wt) and forcing frequency (w) is equal to natural frequency of system. If equivalent viscous damping for system is assumed 1 % of the critical damping, find the number of cycles required to 80% of maximum amplitude. [5]

Q.5 Define resonant frequency and resonant response. write mathematical expression for displacement, velocity, and acceleration response. [2]