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M.E. (Mechanical Engineering) Second Semester
MME-204: Structural Dynamics

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt _five_ questions in all, selecting atleast two questions from each Unit. Supplement your answer with suitable sketches wherever required. Assume any missing data suitably

x-x-x

UNIT – I

I. An accelerometer is used to measure the vibration signal produced by a vibrating machine which is vibrating with a mixed signal of three sinusoidal signals at 100 Hz, 200 Hz and 300 Hz. Draw and compare time domain and frequency domain signals captured during modal testing. Also compare the pros and cons of both the signals. (10)

II. Modal testing of a cantilever beam is required to be conducted. Draw a schematic of the experimental set-up. Will it be better to mount the accelerometer near the fixed end or near the free end of the beam? Why? (10)

III. By using energy method, derive the formula for natural frequency of a spring mass system wherein mass of the spring is not negligible. (10)

IV. Write a MATLAB program which should be able to demonstrate the dynamic responses of a critically damped system. (10)

UNIT – II

V. Write a MATLAB program to demonstrate the bandwidth method for evaluating damping. (10)

VI. Apply constant acceleration method in evaluating structural responses of a critically damped mechanical system wherein mass, stiffness, differential force, initial displacement, initial velocity and initial acceleration of the system are 1 kg, 10 kN/m, 100 N, 1 mm, 200 m/s and 10 m/s^2 respectively. (10)

VII. How many types of shape functions are possible in finite element method based analysis of beam elements? Give examples. (10)

VIII. Write a MATLAB program to solve equation of motion of uniform beam under flexural vibration conditions when both ends of the beam are fixed. (10)

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