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AU/ME-7001-CBGS

B.E. VII Semester

Examination, June 2020

Choice Based Grading System (CBGS)

Mechanical Vibrations

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.
ii) All questions carry equal marks.

1. Define the following characteristics of vibrations:
   i) Vibration displacement
   ii) Vibration velocity
   iii) Vibration acceleration
   iv) Periodic motion
   v) Time period
   vi) Frequency
   vii) Amplitude

2. A machine member is in the form of a cantilever beam of length L, moment of inertia I and modulus of elasticity E and carries a mass *m* at it's free end. Find the natural frequency of lateral vibrations in the plane of paper when the beam has negligible mass. If the cantilever has a rectangular section 5 cm deep and 2.5 cm deep. Find the ratio of frequency of free vibrations in vertical plane to that of an horizontal plane.

3. a) What assumptions are made in finding the natural frequency of a single degree of freedom using energy method?

b) A spring mass system has a natural frequency of 10 Hz. When the spring constant is reduced by 800 N/m, the frequency is altered by 45 percent. Find the mass and spring constant of original system.

4. a) What happens to the response of an undamped system at resonance?

b) Consider a spring mass system with k = 4000 N/m and m = 10 kg subject to harmonic face F(t) = 400 cos10t Newton. Find and plot the total response of the system under the conditions $x_0 = 0.1$ m and $\dot{x}_0 = 0$ and $x_0 = 0$ and $\ddot{x}_0 = 10\,\text{m/sec}$.

5. a) What do you mean by a vibrating system with two degree of freedom? Explain with example.

b) Find the natural frequency of the car with following condition : Total mass of the car is 300 kg, wheel base 3.0 m and radius of gyration is 1.0 m and spring constants of the front and rear springs are 70×10^3 N/m each.

6. Derive an expression for critical speed of a light flexible shaft with an unbalanced disk at the centre of shaft with damping.

7. Find the natural frequency of a three mass-spring system connected in series and hanging vertically.

8. Write short notes on any two:

a) Vibration isolation

b) Torsional vibration

c) Vibration measurement

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