4. a) Define Node point and mode shape.

   b) What do you understand by principal modes of vibration?

   c) Derive an expression to determine length of torsionally equivalent shaft.

   d) Determine the natural frequencies for the system shown in fig-2. Assume:

   k_1=1000N/m, k_2=500N/m, m_1=50kg, m_2=10kg.

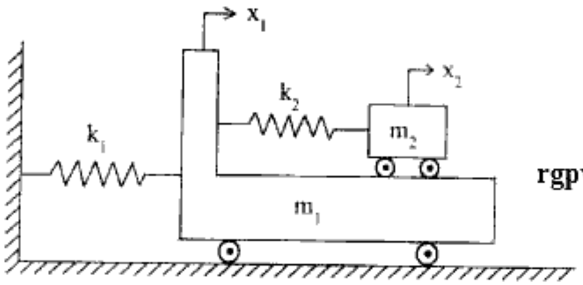

Fig. 2

OR

Explain the principle of dynamic vibration absorber. What is a tuned absorber?

5. a) What is meant by term "Sound Spectra"?

   b) What do you understand by term "Weighting Networks"?

   c) Show that when the distance from point of source is doubles the sound intensity level decreases by 6 dB.

   d) Explain the noise exposure limits for persons working in industry recommended by OSHA.

OR

Write a short note on Noise control techniques.

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Roll No ....

AU/ME-703

B.E. VII Semester

Examination, December 2015

Mechanical Vibration & Noise Engineering

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

1. a) What is beat phenomena?

   b) Distinguish between longitudinal, transverse and torsional vibration.

   c) A harmonic motion is given by equation $x=5\sin(4t+\Phi)$. Find its two components, one that leads it by 30° and other that lags it by 80°.

   d) The sphere of diameter D floats half submerged in water. If the sphere is depressed slightly and released, determine the period of vibration. What is the time period if D=1m.

OR

A spring mass system with mass m and stiffness k has a natural frequency of f. Determine the value of stiffness k' of another spring which when,

a) Connected in series with spring k, will lower the natural frequency by 20%

b) Connected in parallel with spring k, will raise the natural frequency by 20%

2. a) Define over damped and under damped system.

b) What do you understand by dry friction damping?

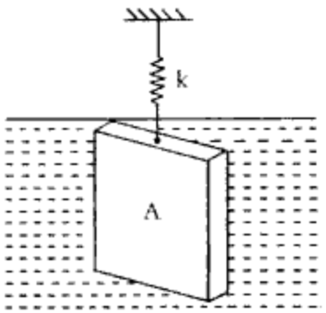
c) Define terms "Damped Natural Frequency" and "Critical Damping Coefficient".

d) A thin plate of area A and weight W is attached to the end of the spring and allowed to oscillate in a viscous fluid as shown in Figure. If f_1 is the frequency of system in air and f_2 is frequency in viscous liquid, show that:

$$\alpha = \frac{2\pi W\sqrt{\left(f_1^2 - f_2^2\right)}}{gA}$$

Where the damping force on the plate is, $F_d = 2\alpha AV$

2A being the total surface area of the plate and V its velocity.



OR

A vibratory system is defined by following parameters:

m=3 kg, K=100N/m, C=3 N-sec/m

Determine

i) Damping factor

ii) Damped natural frequency

iii) Logarithmic decrement

iv) Ratio of two consecutive amplitudes.

3. a) Define

i) Magnification factor

ii) Transmissibility Ratio

b) What do you understand by whipping speed?

c) What is meant by vibration isolation?

d) A system of beam supports a mass of 1200 kg. The motor has unbalanced mass of 1 kg located at 6.0 cm radius. It is known that resonance occurs at 2210 rpm. What amplitude of vibration can be expected at the motor's operating speed of 1440 rpm, if damping factor is assumed to be less than 0.10.

OR

A disc of mass 4kg is mounted midway between bearings which may be assumed to be simple supports. The bearings span is 48mm. The steel shaft which is horizontal is 9mm in diameter. The CG of the disc is displaced 3mm from the geometric centre. The equivalent viscous damping at the centre of the disc shaft may be taken as 49 N-sec/m. If the shaft rotates at 760 rpm, find the maximum stress in the shaft and compare it with dead load stress in the shaft. Also find the power required to drive the shaft at this speed.