OR

A steel shaft 1.5m. long is 95mm. in diameter for the first 0.6 m. of its length, 60 mm. in diameter for the next 0.5 m. of the length and 50 mm. in diameter for the remaining 0.4 m. of its length. The shaft carries two flywheels at its two ends. The first having a mass of 900 kg and 0.85 m. radius of gyration located at the 95 mm. diameter end and second having a mass of 700 kg and 0.55 m. radius of gyration located at the other end. Determine the location of the node point and the natural frequency of free torsional vibration of the system. The modulus of rigidity of the shaft material may be assumed as 80 GN/m^2.

5. a) Why do we need decibel sound level scale?
   b) What do you understand by terms threshold shift and daily dose of noise?
   c) Explain the need of octave band analysis in noise control.
   d) Explain in brief, following terms with respect to noise:
      i) Loudness and equal loudness contours
      ii) Auditory effect of noise

OR

What is industrial noise and what are its hazards to workers and organization?

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Total No. of Questions :5] *[Total No. of Printed Pages : 4*

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AU/ME-703

B.E. VII Semester

Examination, December 2016

Mechanical Vibration And 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) Differentiate between periodic motion and harmonic motion.
   b) What are the important assumptions in mathematical modeling of a vibratory system?
   c) Find the expression of equivalent spring stiffness when two spring of different stiffness are connected (i) in series and (ii) in parallel.
   d) A cylinder of radius *r* and mass M rolls without slipping on a cylindrical surface of radius R. Find natural frequency for small oscillations about the lowest point.

OR

The exhaust from a single cylinder four stroke diesel engine is connected to a silencer and the pressure therein is to be measured with a simple U tube manometer. Calculate the minimum length of a manometer tube so that natural frequency of oscillations of the liquid column will be 3.5 times slower than the frequency of the pressure fluctuations in the silencer for an engine speed of 600 rpm.

2. a) Discuss in brief, various types of damping.
   b) What are the practical applications of critical damping?
   c) Find the expression for damping co-efficient in terms of circular efficiency, mass of vibrating body and damping factor.
   d) A vibrating system having mass 1 kg is suspended by a spring of stiffness 1000 N/m and is put to harmonic excitation of 10 N. Assuming viscous damping, determine:
      i) The resonant frequency
      ii) The phase angle
      iii) The amplitude at the resonance
      iv) The frequency corresponding to peak amplitude
      v) Damped frequency

OR

A shock absorber is to be designed so that its overshoot is 10% of the initial displacement when released. Determine the damping factor.

If the damping factor is reduced to one half of these values, what will be the overshoot?

3. a) Differentiate between transient vibrations and steady state vibrations.
   b) What is Magnification factor and how does it vary with frequency ratio?
   c) What are the different isolating materials and what are their applications?
   d) A vibratory body of mass 150 kg supported on springs of total stiffness 1050 kN/m has a rotating unbalance force of 525 N at a speed of 6000 rpm. If the damping factor is 0.3, determine :
      i) The amplitude caused by unbalance and its phase angle
      ii) Transmissibility
      iii) Actual force transmitted

OR

The following data relate to a shaft held in long bearing:

Length of shaft	= 1.2 m
Diameter of shaft	= 14 mm
Mass of rotor fitted at mid span	= 16 kg
Eccentricity of centre of mass of rotor from centre of rotor	= 0.4 mm
Modulus of elasticity of shaft material	= 200 GN/m^2
Permissible stress in shaft material	= 70×10^6 N/m^2

Determine the critical speed of the shaft and the range of speed over which it is unsafe to run the shaft. Assume the shaft to be mass less.

4. a) Define "Principal mode of vibration".
   b) What do you understand by "Semi definite system"?
   c) What is main disadvantage of dynamic vibration absorber? What is a tuned vibration absorber?
   d) Figure 1 shows a vibrating system having two masses $m_1 = 2$ kg and $m_2 = 0.5$ kg and two springs of stiffnesses $K_1 = 30$ N/m, $K_2 = 10$ N/m, Determine :
      i) Two natural frequencies of vibrations
      ii) Ratio of amplitudes for the two modes of vibration

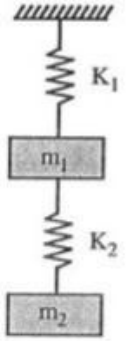

Figure 1