Total No. of Questions : 10]

SEAT No. :

P3037

[Total No. of Pages : 3

[5670]-133
B.E. (Mechanical)
DYNAMICS OF MACHINERY
(2012 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

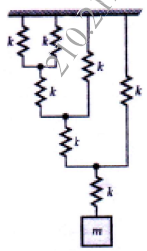
1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures to the right indicate full marks.***

Q1) a) A 3 cylinder radial engine has cylinders located 120º from each other. Reciprocating mass of each cylinder is 1.2 kg. Length of crank is 75 mm and each connecting rod is 250 mm long. Find out maximum primary and secondary unbalance forces, if the engine runs at 2500 rpm. **[6]**

b) Why single cylinder engine cannot be completely balanced? **[4]**

OR

Q2) a) Find the natural frequency of the system shown in following fig. **[6]**
Take K = 2×10^5 N/m and m = 20 kg.



b) Explain with displacement-time plot, the over damped, critically damped and under damped vibratory systems. Give suitable examples. **[4]**

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Q3) a) Define the following terms related to vibrations : **[6]**
i) Logarithmic decrement
ii) Damping coefficient
iii) Damping factor

b) A spring mass system has spring stiffness "k" N/m and a mass of "m" kg. It has natural frequency of vibration as 12 Hz. An extra 2 kg mass is coupled to "m" and the natural frequency reduces by 2 Hz. Find the values of k and m. **[4]**

OR

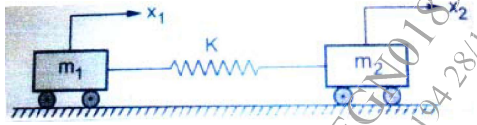
Q4) The static deflection of an automobile on its springs is 100 mm. Find the critical speed when the automobile is travelling on a road, which can be approximated by a sine wave of amplitude 80 mm and a wavelength of 16 m. Assume the damping to be given by (damping ratio: 0.05)
Also determine the amplitude of vibration at 75 km/hr. **[10]**

Q5) a) The flywheel of an engine driving a dynamo has mass of 200 kg and has a radius of gyration of 300 mm. The shaft at the flywheel end has an effective length of 250 mm and is 50 mm diameter. The armature mass is 225 kg and has a radius of gyration of 255 mm. The dynamo shaft has a diameter of 43.75 mm and a length of 200 mm. Neglecting the inertia of the shaft and coupling, calculate the frequency of the torsional vibrations and position of node. Take the modulus of rigidity for shaft material as 80 GPa. **[12]**

b) Explain the concept of torsionally equivalent shaft and derive the equaion for its equivalent length. **[6]**

OR

Q6) a) Find Natural frequencies and mode shapes for the system shown. **[12]**
Consider m_1 = 25 kg, m_2 = 20 kg and k = 2000 N/m.



b) Explain Principal Modes of vibration with example. **[6]**

Q7) a) Explain condition monitoring of machines. Explain different techniques for it. **[8]**

b) A seismic instrument is used to find the displacement, velocity and acceleration of a machine running at 250 rpm. If the natural frequency of instrument is 5 Hz and it records the displacement 5 mm, find the displacement, velocity and acceleration of vibrating machine assuming no damping. **[8]**

OR

Q8) a) Explain with neat diagram the construction and working of seismic instrument. **[8]**

b) A vibrometer with a natural frequency of 2 Hz and with negligible damping is attached to a vibrating system which performs a harmonic excitation. Assuming the difference between the maximum and minimum recorded values are 0.6 mm determine the amplitude of motion of the vibrating system when its frequency is 20 Hz and 4 Hz. **[8]**

Q9) a) Show that if the sound pressure is doubled, then the sound pressure level increases by almost 6 dB. **[6]**

b) State and explain various types of sound fields. **[6]**

c) Noise at the construction site is contributed by a few construction activities such as Piling work : 104 dB, Scraper: 93 dB, Bulldozer: 94 dB, Mobile compressor: 73 dB and Mechanical Shovel: 76 dB on A weighing network. What is the overall sound pressure level? **[4]**

OR

Q10) a) Explain acoustic material & its characteristics. **[6]**

b) Explain in brief various sources of noise and how to control the same. **[6]**

c) Determine the sound pressure level of a source that generate a following rms sound pressure. **[4]**

i) 1.7 N/m^2

ii) 0.7 Pa

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