

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), May 2016
B. Tech in Mechanical Engineering, Semester VI

Roll No.....

COURSE CODE: ME-605 Mechanical vibration and control

Time: 3 hours Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
 2. Assume suitable data wherever required and mention it clearly.
 3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
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Q.1A Objective type questions (10 questions @ 1 mark)

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1. The amplitude of vibration in a rotating shaft decreases at speed:
(a) Less than its critical speed
(b) More than its critical speed
(c) In both cases a and b
(d) None of the above
2. Vibration absorbers are used to reduce:
(a) Amplitude of vibration (b) frequency of system
(c) Phase of vibration (d) All of these
3. An accelerometer is used to measure
(a) high natural frequency
(b) low natural frequency
(c) low and high natural frequency
(d) None of these.
4. Static coupling occurs due to :
(a) Static displacement and dynamic inertia forces.
(b) static displacement
(c) dynamic inertia forces
(d) all the above statement are true.
5. Viscous damping present in a system leading to a periodic motion is known as
(a) Under damping (b) critical damping
(c) Over damping (d) None of these
6. Transient response is due to
(a) suddenly applied force
(b) non periodic excitation
(c) both a and b
(d) none of the above
7. Vibration transmission is effective at a frequency ratio
(a) less than $\sqrt{2}$ (b) At $\sqrt{2}$
(c) more than $\sqrt{2}$ (d) Cannot be said definitely.
8. A periodic odd function, when expressed in Fourier series will have

- (a) Odd harmonic (b) Even harmonic
(c) Both a and b (d) None of the above
9. A non linear pendulum will have amplitude depending on
(a) time period (b) phase angle
(c) both a and b (d) None of these.
10. Briefly define two degree of freedom system.
- Q.2 Short answer type questions (4 questions @ 2.5 marks) 10
(a) Discuss forced vibration.
(b) What do you mean by whirling of the shaft?
(c) Explain degree of freedom and constraint.
(d) Explain Vibrations and its types.
- Q.3A Give the comparative analysis of viscous and columbic damping. 05
Q.3B A spring mass system k_1, m has a natural frequency $=f_1$. If a second spring k_2 is added in series with the first spring, the natural frequency is lowered by $1/2 f_1$. Determine k_2 in terms of k_1 . 05
- Q.4A For a viscously damped system excited by a harmonic force, $F=F_0 \sin \omega t$, the resonating amplitude is found to be 5.8mm. At 80% of the resonating frequency the amplitude is observed as 4.6mm. Calculate the damping factor for the system from the above observed data. 05
Q.4B Split the harmonic motion $X=20 \sin (\omega t +30)$ into two harmonic motion of one having a phase angle of zero and other having a phase angle of 50 degree. 05
- Q.5A Derive the expression for energy dissipated to viscous damping in forced vibration. 05
Q.5B What is logarithmic decrement factor? Derive the expression for logarithmic decrement factor in damped free vibration 05
- Q.6A What are absorbers? Elaborate one its type. 05
Q.6B A damped spring mass system is released from rest from a positive initial displacement X_0 . If the succeeding positive amplitude is $1/2 X_0$ calculate the damping ratio of the system. 05
- OR
- Q.6B Explain degenerating system with diagram and the derivation. 05
- Q.7A Explain multiple degree of vibration with diagrams. 05
Q.7B Explain Holzers method. 05
- OR
- Q.7B Explain the Lanchester damper with diagram. 05
- Q.8A The displacement of a vibrating body is given by $5\sin(31.415t+\pi/4)$. Draw the variation of displacement for one cycle of vibration and also determine the displacement of the body after 0.11 second. 10

- Q.9A Define continuous vibration system. 10
Derive the expression for the free longitudinal vibration of a uniform bar of length L and one end of which is fixed and other end is free.
- Q.9B Explain Newton method for multiple degree of freedom system. Also define flexibility influence coefficient and stiffness coefficient. 10
- OR
- Q.9B Derive the natural frequency of oscillation of the double pendulum. where $m_1=m_2=m$ and $L_1=L_2=L$. 10