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**PRESIDENCY UNIVERSITY
BENGALURU**

SCHOOL OF ENGINEERING

TEST – 1

Winter Semester: 2021 - 22

Course Code: MEC 212

Course Name: Mechanical Vibrations

Programme & Sem: B.Tech, & VI Sem

Date: 26th April 2022

Time: 10.00 AM to 11.00 AM

Max Marks: 30

Weightage: 15%

Instructions:

- (i) Answer the following questions
- (ii) Assume missing data

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries FOUR marks. (3Qx4M=12M)

1. Define the following
a)SHM b)DOF c)Resonance d) Amplitude (C.O.No.1) [Knowledge level]
2. Define Vibrations. Explain Beats Phenomenon with a neat sketch.
(C.O.No.1) [Knowledge level]
3. Find the natural frequency of the system shown in fig 1, take $k_1=k_2=1500\text{N/m}$ & $k_3=2000\text{N/m}$
(C.O.No.2) [Application level]

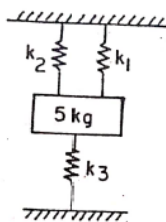


Fig.1

Part B [Thought Provoking Questions]

Answer both the Questions. Each question FIVE marks. (2Qx5M=10M)

4. Rajesh and company are into spring manufacturing they need to design a simple spring mass system for a automobile suspension, what should be the natural frequency that has to be used suggest the motion using energy method. (C.O.No.2) [Application level]

5. A designer is planning to design a spring. An unknown weight added to an unknown spring K has a natural frequency 95 CPM. When 5N is added to W , the natural frequency is lowered to 75 CPM. What is the weight and spring constant he has to consider.

(C.O.No.2) [Application level]

Part C [Problem Solving Questions]

Answer the Question. Question carries EIGHT marks.

(1Qx8M=8M)

6. Represent the Fourier series for the curve shown in Fig.2

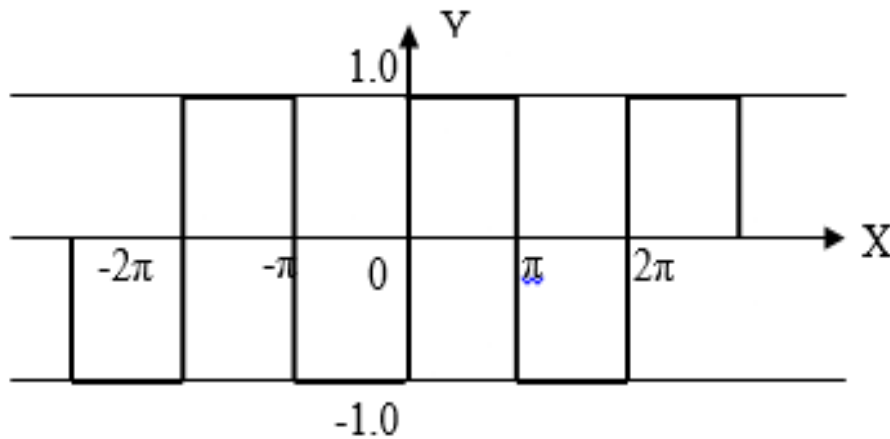


Fig.2



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**PRESIDENCY UNIVERSITY
BENGALURU**

SCHOOL OF ENGINEERING

TEST 2

Even Semester: 2021 – 22

Course Code: MEC 212

Course Name: Mechanical Vibrations

Program & Sem: B. Tech & VI Sem

Date: 1st June 2022

Time: 10.00 AM to 11.00 AM

Max Marks: 30

Weightage: 15%

Instructions:

- (i) Read the all questions carefully and answer accordingly.
(ii) Calculator is allowed during the exam
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Part A [Memory Recall Questions]

Answer all the Questions. Each question carries FOUR marks.

(3Qx 4M= 12M)

Q.NO.1 Define the Following i) Critical Speed ii) Magnification Factor. (C.O. No.3) [Knowledge]

Q.NO.2. With a neat sketch Explain Logarithmic Decrement. (C.O. No.3) [Knowledge]

Q.NO.3.. Define i) Transmissibility ratio ii) Forced Vibration. (C.O. No.3) [Knowledge]

Part B [Thought Provoking Questions]

Answer both the Questions. Each question carries FIVE marks.

(2Qx5M=10M)

Q.NO.4. Equipment's are designed to measure of displacement of the vibrating body and with low natural frequency and the instrument is used to measure any vibration characteristic's and it works on higher frequency ratio in this aspects with a neat sketch explain the working principle of vibration measuring instrument. (C.O.No.4) [Comprehension]

Q. NO.5 A Vibrometer gives a reading of relative displacement of 0.5 mm. The natural Frequency of vibration is 600rpm and the machine runs at 200 rpm, Determine the magnitude of displacement, velocity and acceleration of vibrating machine part. (C.O.No.4) [Application]

Part C [Problem Solving Questions]

Answer the Question. The question carries EIGHT marks.

(1Qx8M=08M)

Q. NO.6 . Consider a vehicle driven on a rough road .It is assumed that the vehicle is constrained to one degree of freedom in vertical direction roughness of the road surface is directly transmitted to the suspension system of the vehicle i.e the spring constant of tyres is infinite. The tyres donot leave the road surface. Mass of the vehicle when fully loaded is 1000kg and 250kg when it is empty. The spring constant is 400kN/m. The damping factor is 0.5 When the vehicle is fully loaded . The speed is 90 km/hr and the road surface varies sinusoidally with a wavelength of 5m and an amplitude of 'y' meter. Determine the amplitude ration for fully loaded condition. (C.O.No.4) [Application]



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**PRESIDENCY UNIVERSITY
BENGALURU**

SCHOOL OF ENGINEERING

END TERM EXAMINATION

Winter Semester: 2021 - 22

Course Code: MEC 212

Course Name: MECHANICAL VIBRATIONS

Program & SEM: B.Tech – VI SEM

Date: 29th June 2022

Time: 9:30 AM to 12:30 PM

Max Marks: 100

Weightage:50%

Instructions:

- (i) Read the all questions carefully and answer accordingly.
- (ii) Scientific calculator is permitted
- (iii) Assume any missing data

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries FIVE marks.

(5Qx 5M= 25M)

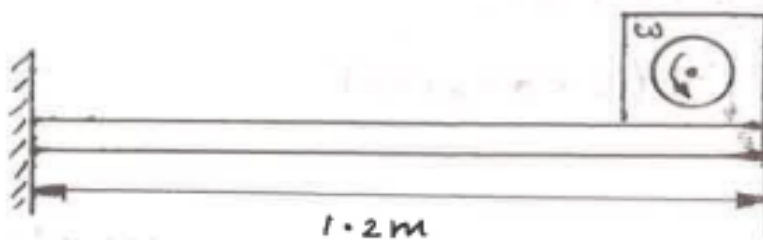
1. Define Vibrations. Explain Beats Phenomenon with a neat sketch.
[5] (C.O.No.1) [Knowledge level]
2. Define the Following i) Critical Speed ii) Magnification Factor
[5] (C.O.No.3) [Knowledge level]
3. Find the natural frequency of the system shown in figure, take $k_1=k_2 = 2000\text{N/m}$ & $k_3 = 5000\text{N/m}$.
[5] (C.O.No.2) [Application level]
4. What are different types of vibrations? Explain any one in detail.
[5] (C.O.No.1) [Knowledge level]
5. Explain Accelerometer with a neat sketch.
[5] (C.O.No.4) [Knowledge level]

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries TEN marks.

(3Qx10M=30M)

- 6.A 40Kg fan has a rotating unbalance of magnitude 0.1 kg-m.The fan is mounted on a beam as shown in Fig.Find the steady state amplitude of the steady state amplitude of the fan when it operates at 1000 rpm.The beam is specially, treated to add viscous damping of $\zeta=0.0617$. $E=200 \times 10^9 \text{N/m}^2$; $I=1.3 \times 10^{-6} \text{m}^2$ [10] .[C.O.No.3] [Application level]

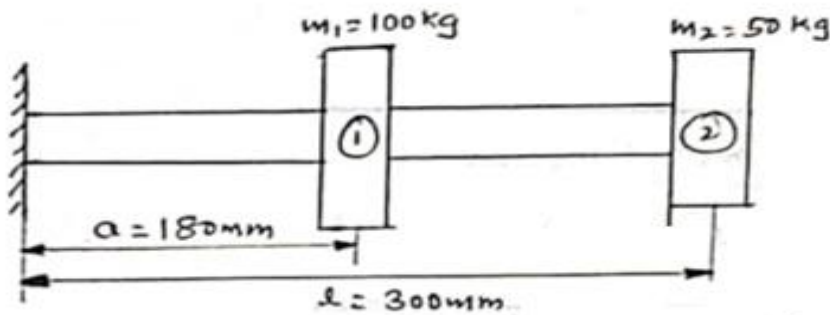


7. Define Logarithmic Decrement and show that it can be expressed as $\delta = 1/n \ln (x_o/x_n)$
 [10] (C.O.No.4) [Application]
8. Vibrometer gives a reading of relative displacement of 0.5 mm. The natural Frequency of vibration is 600rpm and the machine runs at 200 rpm, Determine the magnitude of displacement, velocity and acceleration of vibrating machine part.
 [10] [C.O.No.3][Application level]

Part C [Problem Solving Questions]

Answer all the Questions. Each question carries FIFTEEN marks. (3Qx15M=45M)

9. Find the lowest natural frequency of vibration for the system shown in Fig by Rayleigh's method. $E=1.96 \times 10^{11} \text{ N/m}^2$, $I=4 \times 10^{-7} \text{ m}^4$
 [15] (C.O.No. 4) [Application level]



10. Add the following harmonic motions and check the solution graphically.
 $X_1=2\cos(\omega t +0.5)$; $X_2=5\sin(\omega t +1.0)$ [15] (C.O.No. 1) [Application level]
11. The weight of an electric motor is 125N and it runs at 1500 rpm. The armature weighs 35N and its centre of gravity lies 0.05 cm from the axis of rotation. The motor is mounted on 5 springs of negligible damping so that force transmitted is $1/11^{\text{th}}$ of the impressed force. Assume that the weight of the motor is equally distributed among the 5 springs. Determine:
 1) Stiffness of each spring
 2) Dynamic force transmitted to the base at the operating speed
 3) Natural frequency of the system [15] (C.O.No. 4) [Application level]