# BACHELOR OF TECHNOLOGY (C.B.C.S.) (2014 COURSE)
## B.Tech.Sem - VII MECHANICAL : WINTER- 2022
## SUBJECT : MECHANICAL VIBRATION

Day : Wednesday | Time : 02:30 PM-05:30 PM

Date : 07-12-2022 | **W-13457-2022** | Max. Marks : 60

**N.B.:**

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Assume suitable data if necessary.

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**Q.1** **a)** Explain free, damped and forced vibration with figures and examples **(06)**

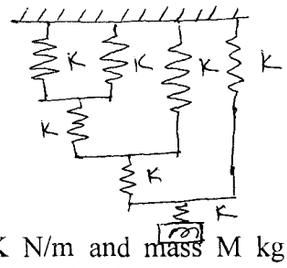
**b)** Define i) damping ii) damping coefficient iii) frequency iv) time period **(04)**

**OR**

**Q.1** **a)** Explain concept of vibration & Oscillation with the help of example **(06)**

**b)** Explain degree of freedom with example. **(04)**

**Q.2** **a)** For mathematical model shown below, find natural frequency of the system $k=4x10^5$N/m, m=40kg, **(06)**

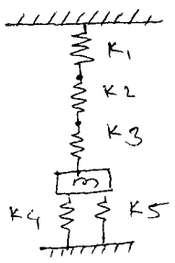



**b)** Spring mass system has stiffness K N/m and mass M kg it has natural frequency as 12Hz. And extra weight 12kg is coupled to M and natural frequency reduced to 2.5 Hz find K and M. **(04)**

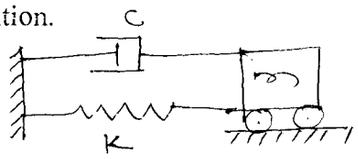
**OR**

**Q.2** **a)** Spring mass system has stiffness K kg/cm and weight W kg it has natural frequency as 20 cps. And extra weight 4kg is coupled to W and natural frequency reduced to 5 cps find K and W. **(06)**

**b)** For system shown below find mass m, $k_1=3600$N/m,$k_2=2400$N/m, $k_3=1600$N/m,$k_4=k_5=500$N/m, natural frequency=15Hz **(04)**




**Q.3** As shown in figure, spring has stiffness 14KN/m, damping coefficient 1400Nsec/m mass 8.6kg. It is at rest in its static equilibrium position when receive the force acting to right that imparts initial velocity of 2.6 m/sec to mass. Find i) expression for displacement X in terms of time t ii) time required for attaining maximum displacement iii) maximum displacement of mass from initial position. **(10)**




**OR**

**Q.3** **a)** Horizontal spring mass system with coulomb damping has mass of 5kg attached to the spring of stiffness 980N/m if coefficient of friction is 0.025b find i)number of cycle corresponding to 50% reduction in amplitude if initial amplitude is 51 mm. ii) time taken to achieve this 50% reduction. **(06)**

**b)** What is logarithmic decrement and derive its expression **(04)**

**Q.4** A motor having mass 6kg is mounted on midway on simply supported shaft of diameter 10mm and length 400mm. the C.G of rotor is 0.02 mm away from geometric center of rotor. If rotor rotates at 2500 rpm find amplitude of steady state vibration and dynamic load on bearing. Assume E=200 GPa. **(10)**

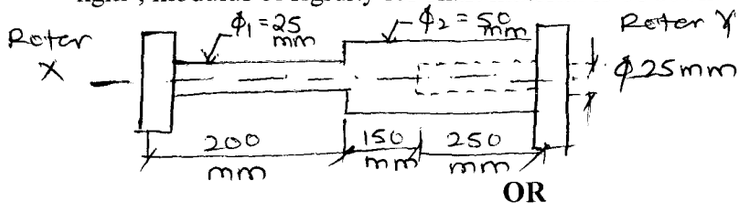
**OR**

**P.T.O.**

**Q.4** **a)** Discuss effect of shaft speed $\omega < \omega c$, $\omega = \omega c$, $\omega > \omega c$ is critical speed of the shaft. **(06)**

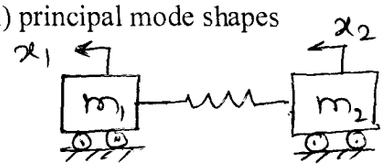
**b)** Explain the terms i) magnification factor ii)motion transmissibility **(04)**

**Q.5** Find natural frequency of torsional vibration of two rotor system shown in figure. The mass moment of inertia of rotor X and Y are 0.20 $kgm^2$ and 0.8 $kgm^2$, modulus of rigidity for shaft material is $80GN/m^2$. **(10)**




**OR**

**Q.5** **a)** Derive the differential equation of motor for following systems $m_1$=20kg and $m_2$=35kg , k=3000N/m. find i)natural frequency ii) amplitude ratio for two node iii) principal mode shapes **(06)**




**b)** Explain Holzer method for linear vibration system. **(04)**

**Q.6** Write short note i) Velocity pickup ii)Acceleration pickup **(10)**

**OR**

**Q.6** **a)** Classify the microphone and explain any one of it with neat sketch. **(06)**

**b)** Classify condition monitoring techniques and explain in details. **(04)**

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