Total No. of Questions : 8]

SEAT No. :

**P644**

[Total No. of Pages : 3

# [6004]-605
# B.E. (Mechanical)
# DYNAMICS OF MACHINERY
## (2019 Pattern) (Semester - VII) (402042)

*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.***
2) ***Neat diagram must be draw wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

***Q1)*** a) A horizontal spring mass system with coulomb damping has a mass of 5 kg attached to a spring of stiffness 980 N/m. If the coefficient of friction is 0.25, calculate: **[8]**

i) the frequency of free oscillations.
ii) the number of cycles corresponding to 50% reduction in amplitude if the initial amplitude is 5cm.
iii) time taken to achieve this 50% reduction.

b) Explain with neat diagram mathematical model of a motor cycle. **[5]**

c) By using energy method, find the natural frequency of undamped free longitudinal vibrations. **[4]**

OR

***Q2)*** a) Derive an expression for the motion of spring-mass dashpot system in case of: **[8]**

i) over damped system
ii) critically damped system
iii) under damped system.

b) A flywheel of mass 10 kg and radius of gyration 0.3 m makes torsional rotations under a torsion spring of stiffness 5 Nm/rad. A viscous damper is fitted and it is found that the amplitude is reduced by a factor 100 over any two successive cycles. Find **[5]**

i) Damping factor
ii) Damping coefficient
iii) Damped frequency
iv) Periodic time oscillation

c) A mass of 3kg is supported on an isolator having a spring constant of 3000 N/m and viscous damping. If the amplitude of free vibration of the max falls to one half its original value in 2 sec, determine the damping coefficient of the isolator. **[4]**

***P.T.O.***

***Q3)*** a) Define quality factor and states its significance in frequencies response curve. **[8]**

b) A single cylinder vertical petrol engine of total mass 400 kg is mounted upon a steel chassis frame and causes a vertical static deflection of 2.5 mm. The reciprocating parts of the engine have a mass of 5 kg and move through a vertical stroke of 120 mm with SHM. A dashpot provided the damping resistance of which is directly proportional to the velocity and amounts to 20 KN at 1 m/s. If a steady state vibrations has been reached. **[10]**

Determine:

i) The amplitude of forced vibrations when the driving shaft of engine rotates at 540 rpm.

ii) The maximum dynamic force transmitted to the ground through chassis frame (which behaves as a spring). Through the dashpot and through the chassis frame and dashpot together.

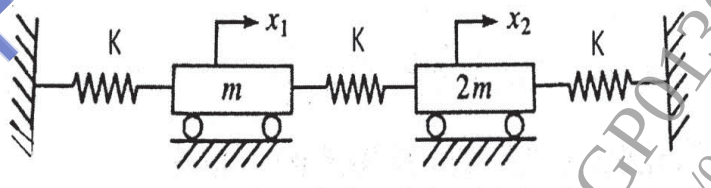
iii) The driving shaft speed at which resonance will occur.

OR

***Q4)*** a) Explain forced vibration with rotating unbalance. **[8]**

b) 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]**

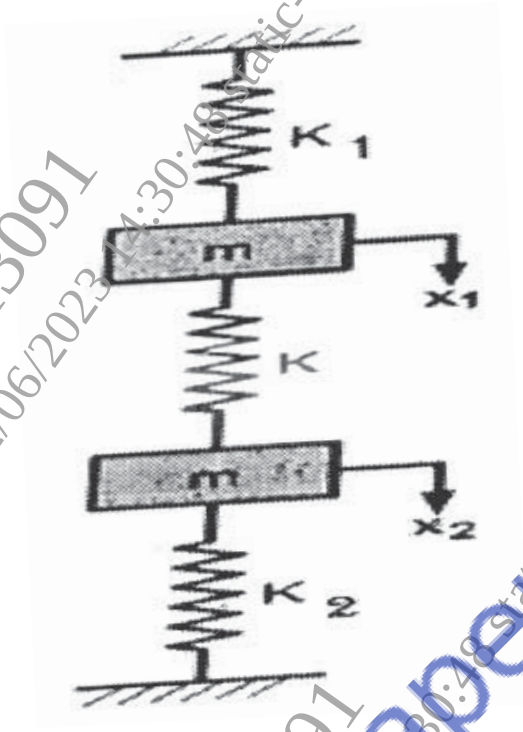
***Q5)*** a) For the system shown in figure, find the natural frequencies of vibration and principal modes of vibration. **[10]**




b) Derive the concept of torsionally equivalent shaft and derive the equation for its equivalent length. **[8]**

OR

***Q6)*** a) Determine the natural frequencies of the system shown in figure 1 using following data: K1 = K2 = 40 N/m, K = 60 N/m, m1 = m2 = 10 kg. **[10]**




b) How do you find Eigen value and Eigen vector by Matrix method. **[8]**

***Q7)*** a) What is vibration isolation? Discuss various methods of vibration isolators. **[8]**

b) Write short notes on: Pass-by-noise. **[5]**

c) Write short notes on: Noise sources and control of industries. **[4]**

OR

***Q8)*** a) Derive an relation between sound intensity level and sound pressure level. **[8]**

b) Write short notes on: FFT Spectrum analyzer. **[5]**

c) Explain with neat sketch the working of sound level. **[4]**

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