Total No. of Questions : 6]

SEAT No. :

P5014

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B.E. /Insem. - 16

B.E. (Mechanical / Automobile Eng. / Mech - SW)

DYNAMICS OF MACHINERY

(2012 Pattern) (Semester - I)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4 and Q.5 or Q.6.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Nonprogrammable Calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) A shaft carries four masses A, B, C and D which are placed in parallel planes perpendicular to the longitudinal axis. The unbalanced masses at planes B and C are 3.6 kg. and 2.5 kg. respectively and both are assumed to be concentrated at a radius of 25 mm while the masses in planes A and D are both at radius of 40 mm. The angle between the planes B and C is 100° and that between B and A is 190°, angles being measured in counter clockwise direction from the plane B. The plane containing A and B are 250 mm apart and those containing B and C are 500 mm. If the shaft is to be completely balanced, determine:

i) Masses at planes A and D

ii) The distance between the planes C and D

iii) The angular position of the mass D **[10]**

OR

Q2) The cranks of four cylinder marine oil engine are arranged at angular intervals of 90°. The engine speed is 70 rpm and the reciprocating mass per cylinder is 800 kg. The inner cranks are 1 m apart and are symmetrically arranged between the outer cranks which are 2.6 m apart. Each crank is 400 mm long. Draw the primary force and couple polygon for the firing order 1-4-2-3 and comment on balancing. **[10]**

Q3) a) Determine the expression for the natural frequency of the system shown in fig. Q.3 (A). Assume that the wires connecting the masses do not stretch and are always in tension. **[4]**

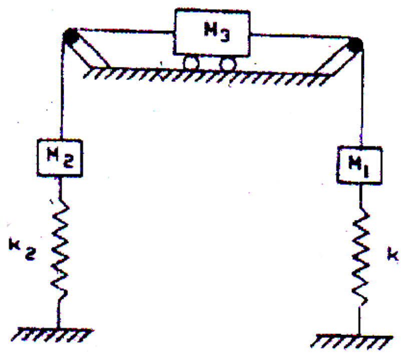

fig.Q.3(A)

b) A body vibrating with viscous damping makes five complete oscillations per second, and in 50 cycles its amplitude diminishes to 10 percent. Determine the logarithmic decrement and the damping ratio. What will be the effect on period of vibration if damping is removed? **[6]**

OR

Q4) a) Derive equation of motion for the system shown in Pig.Q.4 (a), If m =1.5 kg. k=4900N/m, a = 6 cm and b = 14 cm. determine the value of C for which the system is critically damped. **[4]**

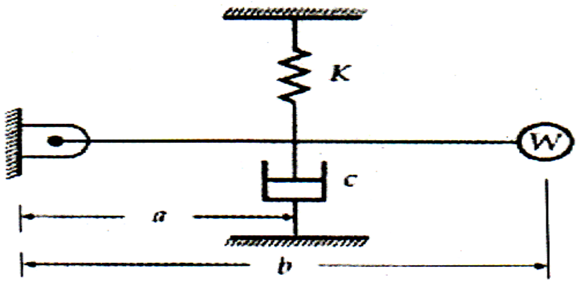

Fig.Q.4(a)

b) A vibrating system is defined by the following parameters m=3kg, k=l00N/m, C=3 N – sec/m. Determine (a) Damping factor.(b)Natural frequency of damped vibration ,(c)I Logarithmic decreinent,(d)Ratio of two consecutive amplitudes and (e) Number of cycles after which the original amplitude is reduced to 20 percent. **[6]**

Q5) a) The damped natural frequency of a system as obtained from a free vibration test is 9.8Hz. During forced vibration test, with constant exciting force on the same system, the maximum amplitude of vibration is found be at 9.6Hz, Determine the damping factor for the system and it's natural frequency. **[4]**

b) A compressor weighing 600N and operating at 1000 rpm, is mounted on six parallel springs of sliffness 6000 N/m each. Determine the maximum permissible unbalance in order to limit the steady state deflection to 5mm peak to peak. **[6]**

OR

Q6) a) A spring – mass-damper systems is subjected to a harmonic force. The amplitude is found to be 0.02 m at resonance and 001 m at a frequency 0.75 times the resonani frequency. Find the damping ratio of the system. **[4]**

b) A machine part of mass 4 kg vibrates in a viscous fluid. Find the damping coefficient when a harmonic exciting force of 50N results in resonant amplitude of 250 mm with a period of 0.4 sec. If the excitation frequency is 2 Hz, find the percentage increase in the amplitude of forced vibration when the damper is removed. **[6]**

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