Total No. of Questions : 12]

SEAT No. :

P2662

[Total No. of Pages :5

[5154]-32
B.E. (Mech.)
DYNAMICS OF MACHINERY
(2008 Pattern) (402042) (Semester - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve in Section I : Q1 or Q2, Q3 or Q4, Q5 or Q6; Section II: Q7 or Q8, Q9 or Q10, Q11 or Q12.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) Four masses A, B, C and D are completely balanced. Masses C and D make angles of 90° and 210° respectively with B in the same sense. The planes containing B and C are 300 mm apart. Masses A, B, C and D can be assumed to be concentrated at radii of 360 mm, 480 mm, 240 mm and 300 mm respectively. The masses B, C and D are 15 kg, 25 kg and 20 kg respectively. Determine: mass A and its angular position. **[10]**

b) With the help of neat sketch, explain the working of dynamic balancing of machine. **[6]**

OR

Q2) A four stroke five cylinder in-line engine has firing order 1-4-5-3-2-1. Centre lines of cylinders are spaced at equal intervals of 150 mm. The reciprocating part per cylinder have mass of 1.5 Kg, Piston stroke is 100 mm and connecting rod are 175 mm long. The engine rotates at 600 rpm. Discuss the primary and secondary balancing values and maximum unbalanced couples about central plane and position of first crank from its inner dead centre position at which these values occurs. **[16]**

P.T.O.

Q3) a) Calculate frequency of damped oscillation of the system as shown in Fig. 1 for the given values, m = 1750 Kg; C = 3500 Ns/m; K = 7×10^5 N/m; a = 1.25 m; b = 2.5 m **[8]**

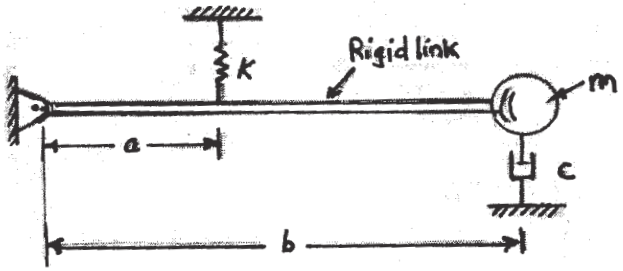

Fig.1

b) Determine natural frequency for the given system as shown in Fig.2 **[8]**

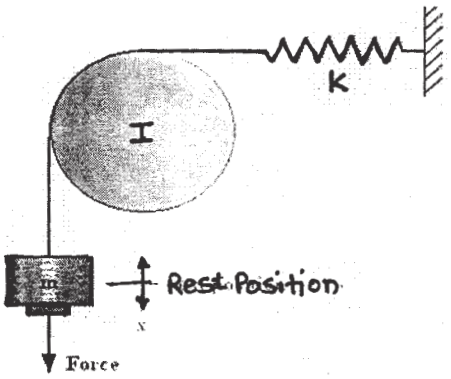

Fig.2

OR

Q4) a) Explain the term 'Vibration isolation' with practical example of any machine. State the suitable materials commonly used as vibration isolation. **[6]**

b) The disc of torsional pendulum has a mass moment of inertia of 600 Kg-m^2 and immersed in a viscous fluid. The brass shaft attached to it is of 10 cm diameter and 40 cm long. When pendulum is vibrating, the observed amplitudes on the same side of rest position for successive cycles are 9°, 6° and 4° respectively.

Determine:

i) Logarithmic decrement

ii) Damping torque at unit velocity.

iii) Periodic time of vibration.

Assume for the brass shaft, G = 4.4×10^{11} N/m^2. **[10]**

Q5) a) Explain following terms: **[8]**

i) Under damped system

ii) Critical damped system

iii) Over damped system

iv) Critical damping coefficient.

b) An air compressor weighs 450N and is operated at a constant speed of 1750 rpm. The unbalanced reciprocating part weigh 10N and rotating part are well balanced. The crank radius is 10 cm. If damper used for mounting introduce a damping factor 0.15, then

i) Specify the spring for the mounting such that only 20% of the unbalance force is transmitted to the foundation

ii) Determine amplitude of transmitted force. **[10]**

OR

Q6) a) An automobile trailer which moves over the road surface making approximately sinusoidal profile with wavelength of 8m and amplitude of 6 cm. Trailer is pulled on road surface with a velocity of 60 km/hr. Find the critical speed if the vibration amplitude is 1.5 cm and for trailer mass of 60 Kg. **[6]**

b) Write short note on any two of following: **[12]**

i) Types of vibrations.

ii) Transmissibility.

iii) Dry friction damping.

SECTION - II

Q7) a) Explain principal mode of vibration with example. **[4]**

b) Determine natural frequencies and amplitude ratios for the given system as shown in fig.2. Also comment on the following cases; $k = \infty$, $m_2 = 0$; $L = 0$; $K = 0$ **[12]**

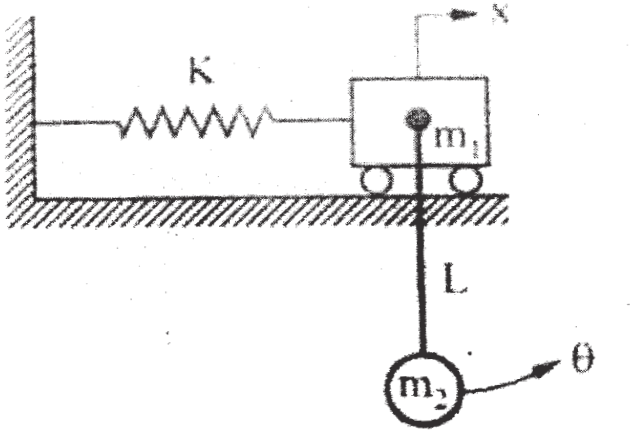

Fig.2

OR

Q8) a) Draw mathematical model of two wheeler. **[4]**

b) Determine natural frequency and corresponding mode shapes of given system as shown in Fig. 3. Assume each spring stiffness is *k*. **[12]**

Fig.3

Q9) a) The static deflection of an automobile on its spring is 10cm under. Find the critical speed when the trailer is travelling over a road with a profile approximated by a sine wave of amplitude 8 cm and wavelength of 16 m. Assume damping to be given by $\xi = 0.05$. What will be the amplitude of vibration at 75 km/hr? **[6]**

b) Write short note on any two of following: **[12]**

i) Frequency measuring instruments.

ii) FFT analyzer.

iii) Vibration Exciters.

OR

Q10)a) Write short note on vibration absorber. **[6]**

b) A commercial type vibration pickup has a natural frequency of 6Hz and a damping factor of 0.65. What is the lowest frequency beyond which the amplitude can be measured within

i) One percent error

ii) Two percent error? **[6]**

c) An undamped vibration pickup having natural frequency of 1Hz is used to measure harmonic vibration of 4Hz. If the amplitude recorded is 0.52 mm, what is the correct amplitude. **[6]**

Q11)a) Explain the terms **[10]**

i) Decibel scale

ii) Sound pressure level

iii) Sound power level

iv) Sound intensity level

v) Frequency range of sound sources

b) Show that as the distance from point source doubles, the sound intensity level decreases by 6 dB. **[6]**

OR

Q12)a) A worker is exposed to noise according to the following schedule: **[6]**

Exposure level [dB]	92	95	97	102
Period of exposure [hrs]	3	2	2	1

Does the daily noise dose is exceeded as per OSHA standards.

b) Write short note on the following (any two). **[10]**

i) Noise measurement system.

ii) White noise.

iii) Sound level meter.