G 642

(Pages : 4)

Reg. No..................................

Name.......................................

B.TECH. DEGREE EXAMINATION, MAY 2014

Seventh Semester

Branch : Mechanical Engineering

DYNAMICS OF MACHINERY (M)

(Old Scheme—Prior to 2010 Admissions—Supplementary)

Time : Three Hours

Maximum : 100 Marks

Part A

Answer **all** *the questions.*
Each question carries 4 *marks.*

1. Explain the balancing of rotating masses in several planes.
2. What do you mean by primary forces, primary couples, secondary forces and secondary couples.
3. Compare the nature of a vibrating body with that of a body executing SHM.
4. Convert a stepped shaft into a torsionally equivalent shaft.
5. For the system shown in fig.1 below, obtain the equations of motion.

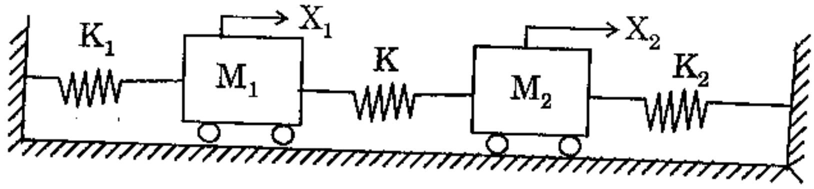

Fig. 1

6. For the system shown in fig. 2 find out the natural frequencies. Given $M_1 = 21.5$ kg, $M_2 = 0.80$ kg. $K_1 = K_2 = 40$ N/m.

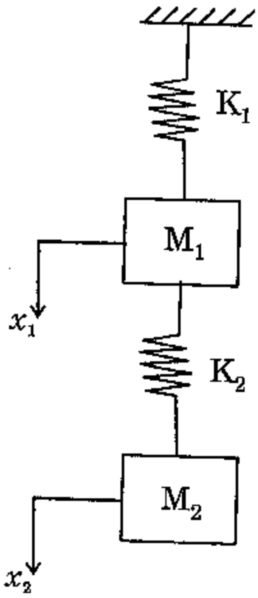

Fig. 2

Turn over

7. Derive the expression for critical speed of a shaft.

8. Explain the load deflection behaviour of a linear spring, soft spring and a hard spring.

9. Explain the pattern of sound propogation.

10. Explain the accoustics of buildings.

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 12 *marks.*

11. Four masses A, B, C and D are completely balanced. Masses C and D make angles of 90° and 195° respectively. with that of mass B in the counter clockwise direction. The rotating masses have the following properties. m_b = 25 kg ; M_c = 40 kg ; m_d = 35 kg ; r_a = 150 mm, r_b = 200 mm, r_c = 100 mm; r_d = 180 mm planes B and C are 250 mm apart.. Determine the (a) mass A and its angular position with that of mass B ; (b) positions of all the planes relative to plane of mass A.

Or

12. The following data refer to a two-cylinder uncoupled locumative :

Rotating mass / cylinder	=	280 kg.
Reciprocating mass / cylinder	=	300 kg.
Distance between wheels	=	1400 mm.
Distance between cylinder centres	=	600 mm.
Diameter of treads of driving wheels	=	1800 mm.
Crank radius	=	300 mm.
Radius of centre of balance mass	=	620 mm.
Locomotive speed	=	50 km/hr.
Angle between cylinder cranks	=	90°.
Dead load on each wheel	=	3.5 tonne.

Determine the :

(a) Balancing mass required in the planes of driving wheels if whole of the revolving and $2/3^{rd}$ of the reciprocating mass are to be balanced.

(b) Swaying couple.

(c) Variation in the tractive effort.

(d) Maximum and minimum pressure on the rails.

(e) Maximum speed of locomotive without lifting the wheels from the rails.

13. A vibrating system consists of a mass of 50 kg, a spring with a stiffness of 30 kN/m and a damper. The damping provided is only 20% of the critical value. Determine :

(a) Damping factor.

(b) Critical damping coefficient.

(c) Natural frequency of damped vibrations.

(d) Logarithmic decrement.

(e) Ratio of two consecutive amplitudes.

Or

14. Determine the time in which the mass in a damped vibrating systsem would settle down to $1/50^{th}$ of its initial deflection for the following data : m = 200 kg ; ρ = 0.22S ; k = 40 N/mm. Also find the number of oscillations completed to reach this value of deflection.

15. A small reciprocating machine of 30 kg. mass runs at a constant speed of 5000 r.p.m. After installation the forcing frequency was found to be too close to the natural frequency of the system. Design a dynamic absorber if the closest frequency of the system is to be at least 20% from the distributing frequency.

Or

16. Two rotors A and B are attached to the ends of a shaft 600 mm long. The mass of the rotor A is 400 kg and its, radius of gyration is 400 mm. The corresponding values of rotor B are 500 kg and 500 mm respectively. The shaft is 80 mm diameter for the first 250 mm, 120 mm for next 150 mm length and 100 mm for remaining length. Modulus of rigidity of the shaft material is 0.8×10^5 N/m^2. Find

(a) The position of the node.

(b) The frequency of torsional vibrations.

17. A spring mass-system shown in fig. 3 which is subjected to a harmonic force F cos wt. Determine the response of the system.

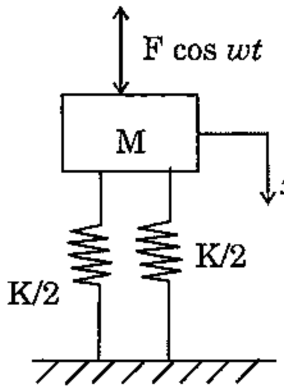

Fig. 3

Or

18. A non-linear spring for a single degree of freedom system is given by $k(x) = 10\,x + 2000\,x^3$. C for viscuous damping is 1.5 kg.sec/cm. A harmonic force 5 kg amplitude acts on the mass = 1 kg. Find the steady-state response using the Direct Integration Method.

19. Explain the following :

    (a) Sound Pressure Level.

    (b) Sound Intensity Level.

Or

20. Explain the process of recording and reproduction of sound.

(5 × 12 = 60 marks)