**F 3454** (Pages : 4) Reg. No.....

Name.....



# B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

**Seventh Semester**

Branch : Mechanical Engineering

DYNAMICS OF MACHINERY (M)

[Old Scheme—Prior to 2010 Admissions]

(Supplementary/Mercy Chance)

Time : Three Hours Maximum : 100 Marks

## Part A

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

1. Explain the conditions of static and dynamic balancing.
2. Explain the effects of Partial balancing in locomotives.
3. Derive the expression for natural frequency using Rayleigh's method.
4. Explain the characteristics of an under damped system with a neat sketch.
5. Determine the influence Coefficients of the system shown in fig. 1.

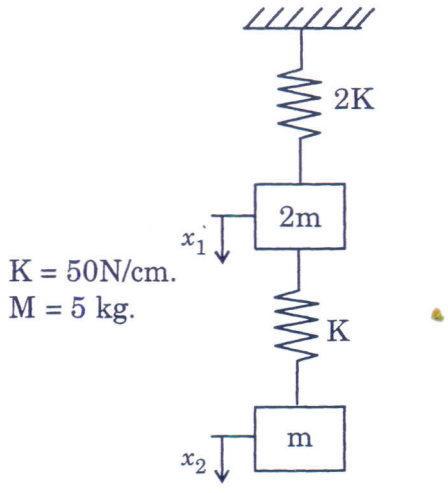


**Fig. 1**

6. Explain mode shape of a system with 3 rotor system.

**Turn over**

7. Describe the behaviour of a light shaft with a disk subjected to resonance.
8. Explain the non-linear characteristics of a soft and hard spring.
9. Describe how sound pressure can be expressed in dB.
10. Obtain the relationship between the sound intensity and the distance from the point source.

(10 × 4 = 40 marks)

## Part B

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

11. A shaft supported in bearings that are 1.6 m. apart projects 400 mm. beyond bearings at each end. It carries three pulleys one at each end and are at the centre of its length. The masses of the end pulleys and 40 kg. and 22 kg. and their centres of mass are at 12 mm. and 18 mm. respectively from the shaft axis. The mass of the centre pulley is 38 kg. and its centre is 15 mm. from shaft axis. The system is statically balanced. Determine (a) the relative angular positions of the pulleys ; (b) dynamic forces developed on the bearings when the shaft rotates at 210 r.p.m.

*Or*

12. A single cylinder reciprocating engine has a reciprocating mass of 60 kg. The crank rotates at 60 r.p.m. and the stroke is 320 mm. The mass of the revolving parts at 160 mm. radius is 40 kg. If $\frac{2}{3}^{rd}$ of the reciprocating parts and whole of the revolving parts are to be balanced, determine the (a) Balance mass required at a radius of 350 mm. ; (b) Unbalanced force when the crank has turned 50° from TDC.

13. A machine part having a mass of 2.5 kg. vibrates in a viscous medium. A force of 30 N acts on the part and causes a resultant amplitude of 14 mm. with a period of 0.22 sec. Find the damping coefficients.

*Or*

14. A body having a mass of 15 kg. is suspended from a spring which deflects 12 mm. under the weight of the mass. Determine the frequency of free vibrations. What is the viscous damping force needed to make the motion aperiodic at a speed of 1 mm. /s. If when damped to this extent, a disturbing force having a maximum value of 100 N and vibrating at 6 Hz is made to act or the body, determine the amplitude of the ultimate motion.

15. A torsional system has an inertia of 1.5 kg-m$^2$. and a torsional stiffness of $4.36 \times 10^3$ N-m./radian It is acted upon by a torsional excitation of 54 rad/sec. Determine the parameter of the absorber to be fixed to the main system if it is desired to keep the natural frequency at least 20 % away from the impressed frequency.

*Or*

16. A reciprocating engine has a mass of 40 kg. and runs at a constant speed of 3000 r.p.m. After it was installed it vibrated with a large amplitude at operating speed. What dynamic absorber should be coupled to the system if the nearest resonant frequency of the combined system has to be at least 25 % away from the operating speed.

17. A spring mass system shown in fig. 2 is initially relaxed and a step-function excitation is applied to the mass. Find the response of the system.

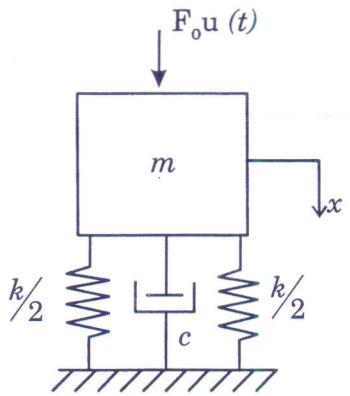


**Fig. 2.**

*Or*

18. A rotor has a mass of 9.5 kg. and is mounted midway on a 24 mm. dia. horizontal shaft supported at the ends by bearings. The bearings are 1.2 m. apart. Speed of shaft is 2000 r.p.m. If the centre of mass of the rotor is 0.12 mm. away from the axis of rotation ; find the amplitude of the steady state vibration and the dynamic force transmitted to the bearing. Take $\in$ = 200 GPa.

19. Give an account about the industrial noise sources. Explain how noise control at source is categorized.

*Or*

20. How decibel scale is defined with the help of suitable equations explain : (a) sound intensity level ; and (b) Sound Power Level.

Specify the reference quantities to define the above scales.

(5 × 12 = 60 marks)