

Total No. of Questions : 10]

P3265

SEAT No. :

[Total No. of Pages : 3

[5670]-533

B.E. (Mechanical)

DYNAMICS OF MACHINERY

(2015 Pattern) (Semester - I) (402043) (End Sem.)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10
- 2) Draw neat diagrams wherever necessary.
- 3) Use of scientific calculator is allowed.
- 4) Assume Suitable data if necessary.
- 5) Figures to the right indicate full marks.

- Q1) a)** A light cantilever of length l , has a mass M , fixed at its free end. Find the frequency of its lateral vibrations. In the vertical plane. **[4]**



- b) Explain frequency response curve with neat labeled diagram. **[6]**
- OR

- Q2) a)** Explain following terms: **[4]**

- i) Zero frequency deflection
- ii) Node point

- b) An underdamped shock absorber is to be designed for a motorcycle of mass 200kg, such that during a road bump, the damped period of vibration is limited to 2 seconds and the amplitude of vibration should reduce to one-sixteenth in one cycle. Find the spring stiffness and damping coefficient of the shock absorber. **[6]**

- Q3) a)** Explain torsionally equivalent shaft. **[4]**

- b) Explain mathematical model of a bicycle with a rider. **[6]**

OR

P.T.O.

Q4) A periodic torque having a maximum value of 0.65 Nm at a frequency corresponding to 5 rad/sec is impressed upon a flywheel suspended from a wire. The wheel has a moment of inertia of 0.15 kg.m² and a wire is having a diameter of 6 mm and a length of 1.2 m. The modulus of rigidity of the material is equal to 0.8×10^{11} N/m². A viscous dashpot applies damping couple of 0.693 Nm at an angular velocity of 1.5 rad/sec. Calculate: **[10]**

- a) The maximum angular displacement from the rest position
- b) The maximum couple applied to dashpot
- c) The angle by which the angular displacement lags the torque.

Q5) The successive cranks of a 5 cylinder inline engine are at 144° apart. The spacing between cylinder center lines is 400 mm. The lengths of crank and connecting rod are 100 mm and 450 mm respectively and the reciprocating mass of each cylinder is 20 kg. The engine speed is 630 rpm. Determine the maximum values of the primary and secondary unbalance forces and couples and the position of the central crank at which these occur. **[16]**

OR

Q6) a) Explain with neat diagram why single cylinder engine cannot be completely balanced. **[6]**

- b) In a three cylinder radial engine, axes of cylinder are coplanar and angles between neighbouring axes are 60°. All cylinders drive same crank of length 220 mm. Each connecting rod is 850 mm long. Reciprocating mass per cylinder is 1.5 kg and the engine runs at 1200 rpm. Find primary and secondary direct and reverse unbalance forces. **[10]**

Q7) a) Explain condition monitoring of machines. Explain different techniques for it. **[6]**

- b) Explain the working of FFT Analyzer. **[6]**

- c) It is required to measure the maximum acceleration of a machine, which vibrates violently with the frequency of 700 cycles per min. Accelerometer with negligible damping is attached to it and the indicator travels by 8.2 mm. If the accelerometer weighs 0.5 kg and has a spring rate of 17500 N/m, what is the maximum amplitude and maximum acceleration of the part? **[6]**

OR

- Q8)** a) What are the different methods of vibration control? Explain any one. [6]
b) Explain working of Magneto-Rheological dampers with neat sketch and application. [6]
c) A vibrometer has a natural frequency of 5 rad/sec and a damping factor of 0.2. An instrument is used to measure a vibrations of a body having a harmonic frequency of 45 rad/sec. The difference between the maximum and minimum reading is 7 mm. Find the amplitude of motion of vibrating body. [6]

- Q9)** a) Explain following terms with respect to sound: [6]
i) Anechoic chamber
ii) Reverberation chamber
b) State and explain various types of sound fields? [6]
c) Calculate the total noise, if there are 4 sources of noise having magnitudes 45 dB, 54 dB, 53 dB, and 52 dB. What would be effect on total noise, if 45 dB noise is switched off? [4]

OR

- Q10)** a) Explain in brief various sources of noise and how to control the same. [6]
b) Explain acoustic material & its characteristics [6]
c) Show that if the sound power is doubled, then the sound power level increases by approximately 3 dB. [4]

