

Total No. of Questions : 10]

SEAT No. :

P1965

[Total No. of Pages : 4

[4859]-1016**B.E. (Mechanical)****DYNAMICS OF MACHINERY****(2012 Pattern)***Time : 2.30 Hours]**[Max. Marks : 70**Instructions to the candidates:*

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Answers should be written in separate answer book.*
- 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) The three cylinders of radial engine have a common crank of radius 75mm. The connecting rod length is 225mm. Find the maximum primary and secondary forces when running at 2800rpm if the reciprocating mass per cylinder is 2 kg. **[6]**
- b) A flywheel of mass 10kg and radius of gyration 0.3 m makes torsional rotations under a torsion spring of stiffness 5Nm/rad. A viscous damper is fitted and it is found that the amplitude is reduced by a factor 100 over any two successive cycles. Find **[4]**
- i) Damping factor
 - ii) Damping coefficient
 - iii) Damped frequency
 - iv) Periodic time of oscillations

OR

- Q2)** a) Show that primary forces in V-90 engine can be completely balanced. **[4]**

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- b) A cylinder of mass m and radius r rolls without slipping inside a cylinder surface of radius R . Find natural frequency for small oscillations about lowest point. [4]

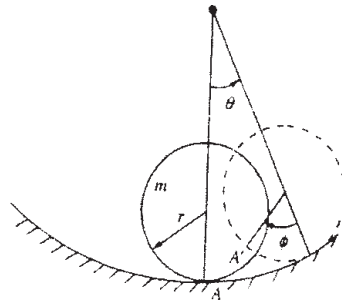


Fig.1

- Q3)** a) Explain significance of critical damping. Give any two applications of critical damping. [4]
- b) Consider the spring-mass-damper system in which mass is given a velocity of 0.1 m/s. What will be the subsequent displacement and velocity of the mass if damping coefficient is 100 Ns/m, spring stiffness is 3000 N/m and mass of 20 kg; $F_0 \sin \omega t = 0$. [6]

OR

- Q4)** a) A body of mass 100kg is suspended on a leaf spring. The system is then vibrate and its natural frequency when measured is 7 rad/s. It is observed that if the initial amplitude is 48 mm, the subsequent amplitudes are 20mm and 32mm. Determine spring stiffness and coulomb damping force. [6]
- b) Plot magnification factor versus frequency ratio curve for different damping conditions and write concluding remarks. [4]
- Q5)** a) Explain degenerate system with any two examples. [4]
- b) Fig. shows an engine connected to a compartment by a spring coupling having an effective linear stiffness of 3×10^6 N/m. The engine weighs 20 tonnes where as the compartment weighs 15 tonnes. Determine the natural frequency of arrangement as shown in Fig.2. [12]

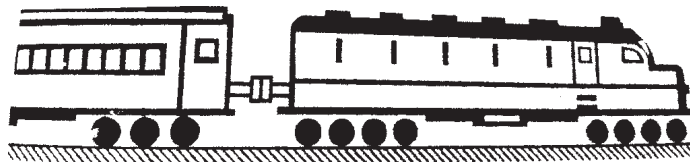


Fig.2

OR

- Q6)** a) Write short note on torsional vibration of geared system. [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

- Q7)** 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) Seismic instruments
 ii) FFT analyzer
 iii) Vibration isolations

OR

- Q8)** a) What are transmissibility curves? Give the significance of these curves. [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 [6]
 i) one percent error
 ii) two percent error?
 c) The motion of under damped vibratory system ($\xi = 0.5$) is to be recorded by a seismic instrument having natural frequency of 3 r/s. What is the reading of the instrument if the motion is given by the equation:
 $x = 2 \sin 2t + 3 \sin 3t$ [6]

- Q9)** 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

- Q10)** a) A worker is exposed to noise according to the following schedule :

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. **[6]**

- b) Write short note on the following (any two). **[10]**
- i) Noise sources and control in industries
 - ii) Mechanism of hearing
 - iii) Loudness of composite sound

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