T.E - VI / Mech / Mechanical Vibrations

04.12.12

90 : 2nd half-12-(j) JP

Con. 9781-12.

KR–8927

(3 Hours) [Total Marks : 100

N.B.: (1) Question No. **1** is **compulsory**.

(2) Solve any **four** from Question Nos. **2** to **7**.

Q 1) Answer any three : (12)

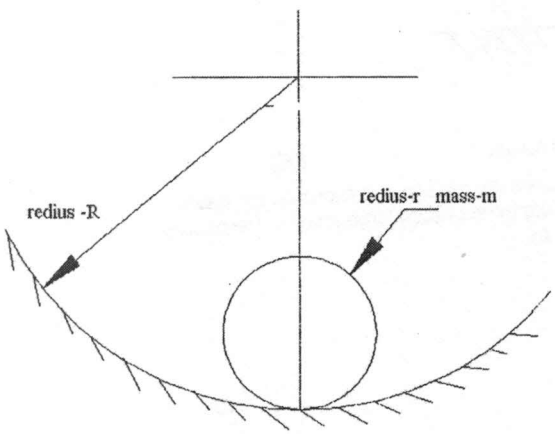
1) Explain different types of damping methods

2) Note on force transmibility & isolation

3) Sketch & explain frequency response curve for rotating unbalance

4) Note on follower jump phenomena in cam.

B) A roller of mass m & radius r rolles without sleeping in curved path of radius R then determine natural frequency of system. (08)



Q. 2) A) Prove that for finding the natural frequency of spring mass system ,the mass of the spring can be taken in to account by adding one third of its mass to the main mass. (10)

B) A Vehicle of mass 1200 Kg. The suspension has a spring constant 400 KN/m, Damping ratio 0.5.If the vehicle speed is 100 Km/Hr determine displacement amplitude of vehicle. The road surface varies sinusoidaly with amplitude of 0.05 m and wavelength of 6 m. (10)

Q. 3) A machine of mass1000 kg is acted upon by an external force of 3000 N at 1800 rpm. To reduce the effect of vibration , isolators having static deflection of 2 mm under machine weight and damping factor of 0.2 are used. Determine

a)amplitude of vibration of machine

b)force transmitted to the foundation

c)phase lag

d)phase angle between transmitted force & exited force. (10)

B) A seismic instrument is mounted on machine at 1000 rpm the natural frequency of seismic instrument is 20 rad/sec . the instruments record relative amplitude of 0.5 mm . compute displacement, velocity & acceleration of machine. Damping of seismic instrument is neglected. (10)

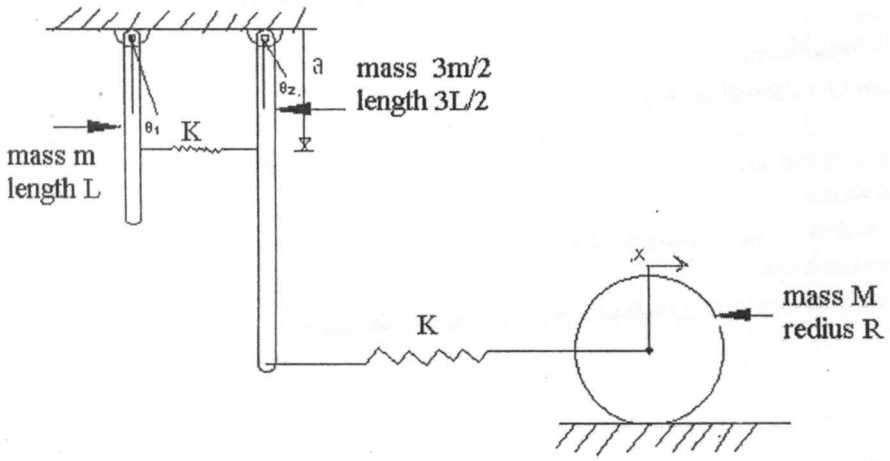
[TURN OVER

Q.4)A) A single degree of freedom viscous damped system makes five complete oscillation per second ,its amplitude reduces to 25% in 45 cycles. Determine a) logarithmic decrement b) damping ratio. **(07)**

B) Explain what do you mean by eigen values & eigen vectors. **(05)**

C) What is the response for single degree freedom underdamped system. **(08)**

Q 5) A) use Lagrange's method to derive the to derive the differential equations governing the motion of the system using θ_1 , θ_2 ,X as generalized coordinates. **(15)**



B) Explain principle of accelerometer with sketch & frequency response curve. **(05)**

Q.6)A) 20 N at 30 cm, 30 N at 60 cm, 10 N at 100 cm from the fixed end are the loading conditions on cantilever beam. The deflection under 30 N load due to all loads is 2 mm. what would be the natural frequency of transverse vibration. The deflection at section I due to unit load at section j is given by

$$U_{ij} = U_{ji} = \frac{S_i^2(3S_j - S_i)}{\text{constant}} \quad \text{for } S_i \geqslant S_j$$

(10)

B) What do you mean by static & dynamic balancing **(05)**

c) Explain procedure to solve balancing of rotating masses in multiple planes **(05)**

Q.7)A) a six cylinder four stroke in line engine has a firing order 1-4-5-2-3-6. Firing order takes place with equal angular interval. The mass of reciprocating parts per cylinder is 2 kg. stroke of 100 mm and connecting rod length 200 mm.the cylinder center lines are spaced at 300 mm apart. The crank shaft speed is 300 rpm. Examine the engine for the balance of primery & secondary forces & couples.if not completely balanced then then determine unbalanced forces and couples. **(14)**

B) Explain why only a part of the primery unbalanced force due to the reciprocating masses is balanced by revolving masses. **(06)**