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Q 1

Q 1

Ans 1

"Part A"

Solution

Given Data

I = 17 ft

I = 14 ft

l = 20 ft

E = 28000 ksi

I = 1200 in^4

$K_{eq} = k_1 + k_2$ $\quad \because k = \frac{12EI}{h^3}$

$k = \frac{12EI}{h_1^3} + \frac{12EI}{h_2^3}$

$= 12EI\left(\frac{1}{h_1^3} + \frac{1}{h_2^3}\right)$

put in values

$= 12 \times 28000 \times 1400\left(\frac{1}{(17\times12)^3} + \frac{1}{(14\times12)^3}\right)$

$= 470,400000 \left(\frac{1}{17\times12^3} + \frac{1}{14\times12^3}\right)$

Q 1 (3)

$$470400000 \times \left[\frac{1}{(1204)^3} + \frac{1}{(120)^3}\right]$$

$$470.400000 \left[6.9649 \times 10^{-7}\right]$$

$$= 327.62 \; 1\text{kin}$$

$$= 3931 \; \text{kft}$$

Q 1

Ans1 Part B

Given Data

$l = 12\ ft$

$Dia = 4''$

$E = 29000\ ksi$

$k = 300\ lb/ft$

Solution

$k_1 = 300\ lb/ft$

$$k_2 = \frac{3EI}{l^3}$$

$$= \frac{3(\times 29000\ lb/in^2) \times (\frac{\pi}{64} \times (2in)^2)}{(12 \times 12\ in)^3}$$

$$= \frac{87000 \times (0.0490 \times 2}{12 \times 12^3}$$

$$= \frac{87000 \times 0.098}{20736}$$

Q.1 Part B

$$\frac{10927220}{2985984}$$

$k_1 = 0.3659 \frac{k}{in}$

$k_2 = 4391.41 \frac{lb}{F}$

$$k_{eq} = \frac{k_1 k_2}{k_1 + k_2}$$

$$\frac{300 \times 4391.4}{300 + 4391.4}$$

$$= \frac{1317420}{4691.4}$$

$k_{eq} = 280.81 \ lb/ft$

Q:

Ans:

Given Data

Mass = 500 kg

harmonic force 5000 sin 150 t

Damping ratio = 7.5%

transmissibility speed = 0.15

force transmitting amplitude = ?

stiffness k.

Solution

$$T_r = \frac{(F_t)_0}{F_0} = \sqrt{\frac{1+(2\xi r\omega)^2}{(1-r\omega^2)^2+(2\times\xi\times r\omega)^2}}$$

$$TR = \sqrt{\frac{1+(2\xi r\omega)^2}{(1-r\omega^2)+(2\times0.0075\times r\omega)}}$$

$$(0.15)^2 = \frac{1+(0.15\times r\omega)^2}{1(-r\omega^2)+(0.0225\, r\omega^2)}$$

$$0.0225 = \frac{1+0.0225x}{(1-x)^2+(0.0225x} \quad \because r\omega = x$$

$$0.0225 = \frac{1+0.0225x}{1+x^2-2x+0.0225x}$$

Q2 (7)

$$0.0225 = \frac{1+0.0225x}{x^2 - 1.9775+1}$$

$$x^2 - 1.9775 + 1 = \frac{1+0.0225x}{0.0225}$$

$$x^2 - 1.9775x + 1 = \frac{1}{0.0225} + \frac{0.0225x}{0.0225}$$

$$x^2 - 1.9775x + 1 = 44.44 + x$$

$$x^2 - 1.9775x + 1 - 44.44 - x$$

$$x^2 - 2.9775x - 43.44$$

By quadratic formula

$$x = 8.25 \quad \because x = \tau w^2$$

$$\sqrt{\tau w^2} = \sqrt{8.25}$$

$$\tau w = 2.87$$

$$\tau w = \frac{w}{w_n}$$

$$2.87 = \frac{150}{\sqrt{\frac{k}{m}}}$$

$$\sqrt{\frac{k}{m}} = \frac{150}{2.87}$$

$$\sqrt{\frac{k}{500}} = (52.66)^2$$

$$\frac{k}{500} = 2731.63$$

$Q = 2$ (8)

$k = 2731.61 \times 500$

$k = ~~1638966~~ \; 1365805 \; N/m$

put all the values

$0.15 = \frac{(F_T)_0}{5000}$

$(F_T)_0 = 0.15 \times 5000$

$(F_T)_0 = 750$ Ans

Q 3

Ans 3

Give Data

Mass $m = 3.0\,kg$

Harmonic force $= P(t) = 25 \sin 75t$

Amplitude $P_0 = 25\,N$

Force frequency $\omega = 75\ \frac{rad}{sec}$

$v_0 = 0.025\,m$

modulus of elasticity $E = 70\,GPa$

$= 70 \times 10^9\,Pas$

Leng $0.5\,m$

Required :→

Diameter $= d = ?$

Solution

For undamped structure

Rd $\frac{v_0}{(v_{st})_0} = \frac{1}{(1 - r\omega)^2}$ ---- (1)

$(v_{st})_0 = \frac{P_0}{k} = \frac{25}{k}$ - (2)

$\omega n = \sqrt{\frac{k}{m}} = \sqrt{k/3}$

Q.3 (10)

$$\omega n = \sqrt{\frac{k}{m}} = \sqrt{\frac{k}{3}}$$

$$\boxed{\omega n = \sqrt{k/3}}$$ natural frequency

$$FR = r\omega \quad \frac{\omega}{\omega n} = \frac{75}{\sqrt{\frac{k}{m}}}$$

$$= \frac{75\sqrt{3}}{\sqrt{k}} \rightarrow (3)$$

$$\frac{0.005}{\frac{25}{k}} = \frac{1}{\left(1-\left(\frac{75\times\sqrt{3}}{k}\right)^2\right)}$$

$$\frac{25}{k} = (0.005)\left(1 - \frac{15625\times3}{k}\right)$$

$$\frac{25}{k} = 0.005 - \frac{84.375}{k}$$

$$0.005 = \frac{109.375}{k}$$

$$k = \frac{109.375}{0.005}$$

$$\boxed{k = 21875 \text{ N/m}}$$

$$I = \frac{kl^3}{3E} = \frac{21875\times0.5^3}{3(70\times10^9)}$$

Q3 (11)

$$I = \frac{2734.375}{21 \times 10^{11}}$$

$$I = 1.302 \times 10^{-8}\ m^4$$

Now $I = \frac{\pi}{64} \times d^4$

$$d^4 = \left(\frac{I \times 64}{\pi}\right)$$

$$d = \left(\frac{I \times 64}{\pi}\right)^{1/4}$$

$$d = \left[\frac{(1.302 \times 10^{-8} \times 64}{3.14}\right]^{1/4}$$

$d = 0.0226\ m$

$d = 0.023 \times 1000$

$d = 22.69\ mm$ Ans

Q 4

Ans 4

Plate boundaries

plate boundaries are the edges where two plates meet

most geological activities including volcanoes, earthquakes and mountain building take place at plate boundar

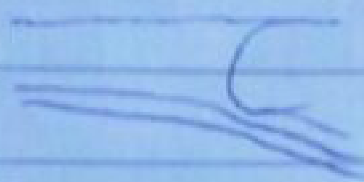
Types of plate boundaries

-> Three type of plate boundaries

* divergent
* convergent
* transform

↳ **Convergent Plate**

These plates are located where lithospheric plate are moving toward one another.

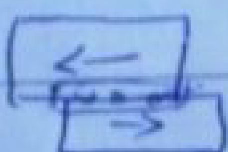


* **Divergent Plate**

These plates are located where plates are moving away from one another

* **Transform Plate**

The fracture zone that form a transform plat



Q 5

Ans 5

Degree of freedom

this system is defined as the number of independent variable required to completley the determine the position of all part of a system at any instant of time.

Continous & Discrete System :->

Some system especially those involving continuous elastic member have infinite number of DOF as an "example of this cantilever beam with self weight.

This beam has bean infinite mass point and need i[illegible] member of displacement to draw its deflect shape and thus has infinite D.O.F

System with a finite number of degree of freedom are called discrete system

System with infinite DOF are called continous system