2009 ME 37-48

ai24btech11035 - V.Preethika

37) A forged steel link with a uniform diameter of 30 mm at the centre is subjected to an axial force that varies from 40 kN in compression to 160 kN in tension. The tensile strength (S_u), yield strength (S_y), and corrected endurance strength (S_e) of the steel material are 600 MPa, 420 MPa, and 240 MPa, respectively.The factor of safety against fatigue endurance as per Soderberg's criterion is

(A) 1.26
(B) 1.37
(C) 1.45
(D) 2.00

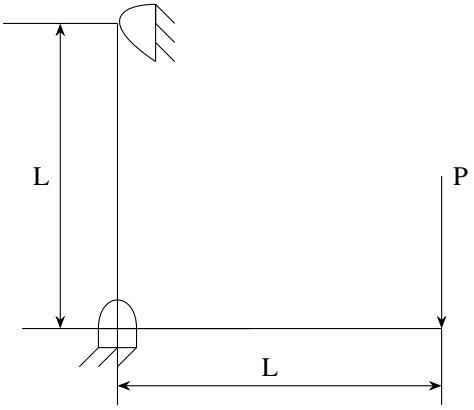
38) An automatic engine weighing 240kg is supported on four springs with linear characteristics.Each of the two front springs have a stiffness of 16 MN/m while the stiffness of each rear spring is 32 MN/m.The engine speed(in rpm),at which resonance is likely to occur,is

(A) 6040 (B) 3020 (C) 1424 (D) 955

39) A vehicle suspension system consists of a spring and a damper.The stiffness of the spring is 3.6 kN/m and the damping constant of the damper is 400 Ns/m.If the mass is 50kg,then the damping factor (d) and damping natural frequency (f_n), respectively,are

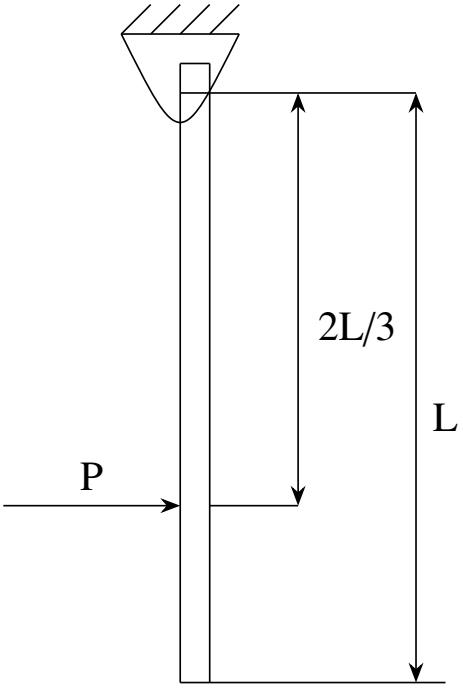
(A) 0.471 and 1.19 Hz
(B) 0.471 and 7.48 Hz
(C) 0.666 and 1.35 Hz
(D) 0.666 and 8.50 Hz

40) A frame of two arms of equal length L is shown in adjacent figure.The flexual rigidity of each arm of the frame is EI.The vertical deflection at the point of application of load P is



(A) $\frac{PL^3}{3EI}$ (B) $\frac{2PL^3}{3EI}$ (C) $\frac{PL^3}{EI}$ (D) $\frac{4PL^3}{3EI}$

41) A uniform rigid rod of mass M and length L is hinged at one end as shown in the adjacent figure.A force P is applied at a distance of $\frac{2L}{3}$ from the hinge so that the rod swings to the right.The reaction at the hinge is



(A) $-P$ (B) 0 (C) $\frac{P}{3}$ (D) $\frac{2P}{3}$

42) Match the approaches given below to perform stated kinematics / dynamics analysis of machine.

Analysis	Approach
P.Continuous relative rotation	1.D'Alembert's principle
Q.Velocity and acceleration	2.Grubler's criterion
R.Mobility	3.Grashoff's law
S.Dynamic-static analysis	4.Kennedy's theorem

(A) P-1,Q-2,R-3,S-4
(B) P-3,Q-4,R-2,S-1
(C) P-2,Q-3,R-4,S-1
(D) P-4,Q-2,R-1,S-3

43) A company uses 2555 units of an item anually.Delivery lead time is 8 days.The reorder point (in number of units) to achieve optimum inventory is

(A) 7 (B) 8 (C) 56 (D) 60

44) Consider the following Linear Programming Problem (*LPP*) :

$$\text{Maximize } z = 3x_1 + 2x_2 \quad (1)$$
$$\text{Subject to } x_1 \leq 4 \quad (2)$$
$$x_2 \leq 6 \quad (3)$$
$$3x_1 + 2x_2 \leq 18 \quad (4)$$
$$x_1 \geq 0, x_2 \geq 0 \quad (5)$$

(A) The LLP has a unique optimal solution
(B) The LLP is infeasible.
(C) The LLP is unbounded.
(D) The LLP has multiple optimal solutions.

45) Six jobs arrived in a sequence as given below. Average flow time (*indays*) for the

Jobs	**Processing Time** (*days*)
I	4
II	9
III	5
IV	10
V	6
VI	8

above jobs using Shortest Processing Time rule is

(A) 20.83 (B) 23.16 (C) 125.00 (D) 139.00

46) Minimum shear strain in orthogonal turning with a cutting tool of zero rake angle is

(A) 0.0 (B) 0.5 (C) 1.0 (D) 2.0

47) Electrochemical machining is performed to remove material from an iron surface of $20\,\text{mm} \times 20\,\text{mm}$ under the following conditions:

$$\text{Inter electrode gap} = 0.2\,\text{mm} \quad (6)$$
$$\text{Supply voltage}\,(DC) = 12V \quad (7)$$
$$\text{Specific resistance of electrolyte} = 2\,\Omega \quad (8)$$
$$\text{Atomic weight of Iron} = 55.85 \quad (9)$$
$$\text{Valency of Iron} = 2 \quad (10)$$
$$\text{Faraday's constant} = 96540\,\text{Coulombs} \quad (11)$$

The material removal rate (ing/s) is

(A) 0.3471 (B) 3.471 (C) 34.71 (D) 347.1

48) Match the following:

NC Code	Definition
P.M05	1.Absolute coordinate system
Q.G01	2.Dwell
R.G04	3.Spindle stop
S.G90	4.Linear interpolation

(A) P-2,Q-3,R-4,S-1
(B) P-3,Q-4,R-1,S-2
(C) P-3,Q-4,R-2,S-1
(D) P-4,Q-3,R-2,S-1