

Level : B.E.

Year : I

Exam Roll No. :

Time: 30 mins.

Course : CIEG 102

Semester : II

F. M. : 10

Registration No.:

Date 10 JAN 2025

SECTION "A"

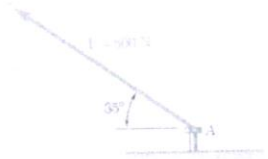
[20Q. × 0.5 = 10 marks]

Choose and encircle the most appropriate answer. Symbols have their usual meanings.

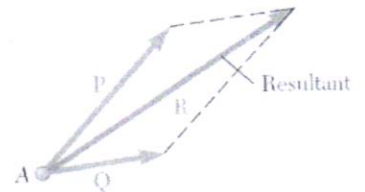
- If two forces P and Q are equal and are acting at an angle α between them, then
 - Resultant is $2P \cos \frac{\alpha}{2}$ or $2Q \cos \frac{\alpha}{2}$
 - Resultant is $2P \cos \frac{\alpha}{2}$ or $2Q \cos \frac{\alpha}{2}$ and angle made by resultant is α
 - Resultant is $2P$ or $2Q$
 - Resultant is $2P$ or $2Q$ and angle made by resultant is 2α

- Which is not considered as the principle of Newtonian mechanics
 - Parallelogram law of forces
 - Principle of transmissibility
 - Newton's first, second and third law of motion
 - Lami's theorem

- 800 N force acts at 35 degree with horizontal as shown in figure, the vertical component of the force is
 - 800 N
 - 559 N
 - 655 N
 - 0 N



- Determining resultant by the help of such figure is termed as
 - Triangle law
 - Equilibrium law
 - Parallelogram law
 - Resolution law



- If moment of inertia about its axis is I and if the effective sectional area is A, then radius of gyration r is given by
 - $\sqrt{\frac{I}{2A}}$
 - $\sqrt{\frac{I}{A}}$
 - $\sqrt{\frac{A}{I}}$
 - $\sqrt{\frac{2I}{A}}$

- Moment of area of semi-circle about its base is
 - $I_{base} = \frac{\pi R^4}{4}$
 - $I_{base} = \frac{\pi R^4}{16}$
 - $I_{base} = \frac{\pi R^4}{2}$
 - $I_{base} = \frac{\pi R^4}{8}$

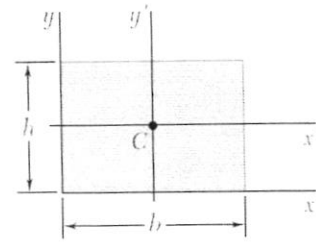
- The equation of a particle starting from rest along a straight line is, $x = t^4 - 3t^2 + 5$. The ratio of the acceleration after 5 second and 3 second will be
 - 1.8
 - 9.4
 - 4.8
 - 5.8

- CORRECT STATEMENT** about the Coefficient of friction is
 - It depends on surface area of the contact
 - It depends on the roughness of the area of contact

- c. It is exactly known value for any surface in contact
- d. Coefficient of kinematic friction is same to the static friction

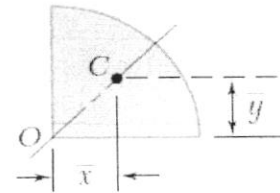
9. **For the given rectangular plan area**

- a. $I_x = \frac{bh^3}{12}$
- b. $I_x = \frac{bh^3}{3}$
- c. $I_y = \frac{bh^3}{3}$
- d. $I_y = \frac{bh^3}{12}$



10. For the Given quarter circle with radius of R, its CG is

- a. $(\frac{4R}{3\pi}, \frac{4R}{3\pi})$
- b. $(\frac{4R}{3\pi}, 0)$
- c. $(0, \frac{4R}{3\pi})$
- d. $(0, 0)$



11. The maximum BM introduced due to UDL of 4 (kN/m), if the span of the cantilever is 3 meter is
- a. 12 kNm
 - b. 18 kNm
 - c. 6 kNm
 - d. 9 kNm

12. For the shown support, the number of reactions are

- a. One
- b. Two
- c. Three
- d. Four



13. A beam is simply supported, and loaded with point load at the center, then
- a. Bending moment is peak at support
 - b. Shear force diagram is parabolic in nature
 - c. Bending moment is peak at the point of load
 - d. Bending moment diagram is parabolic in nature
14. Degree of static indeterminacy (DSI) of structure depend on
- a. Loading
 - b. Types of materials
 - c. Cross Section of the member
 - d. Types and number of joint/Support
15. For the 2D truss, total number of joint is 7, total number of members is 11 and total number of joint reaction is 3, then
- a. External indeterminacy is zero
 - b. Total indeterminacy is one
 - c. Internal indeterminacy is one
 - d. Total degree of static indeterminacy is five
16. Point of contra flexure is
- a. Where the bending moment change its sign
 - b. Shear force change its sign
 - c. Bending moment is maximum
 - d. Bending moment is minimum

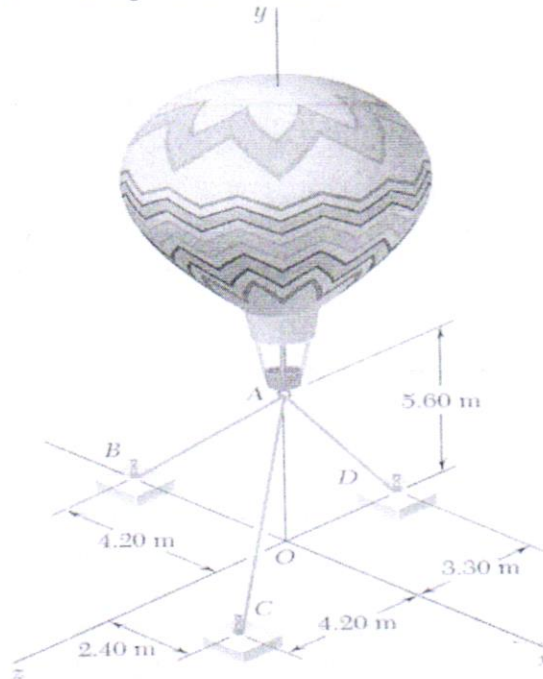
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17. The expression given is $\frac{F_1}{a_1} = \frac{F_2}{a_2} = \frac{F_3}{3} = \text{constant}$
- a. Newton's first law of motion
 - b. Newton's second law of motion
 - c. Newton's third law of motion
 - d. Linear momentum
18. For free body diagram, the INCORRECT STATEMENT IS
- a. Weight of the body is shown
 - b. Reaction at contact point should be shown
 - c. Support is shown
 - d. Magnitude of forces are enough
19. The position of a particle is defined by $x = t^3 - t^2 - 15t + 40$, then the time at which velocity becomes zero is
- a. 2 seconds
 - b. 5 seconds
 - c. 3 seconds
 - d. 1 seconds
20. A bus travelling in a straight line is
- a. Rectilinear motion
 - b. Curvilinear motion
 - c. Static motion
 - d. Dynamic motion

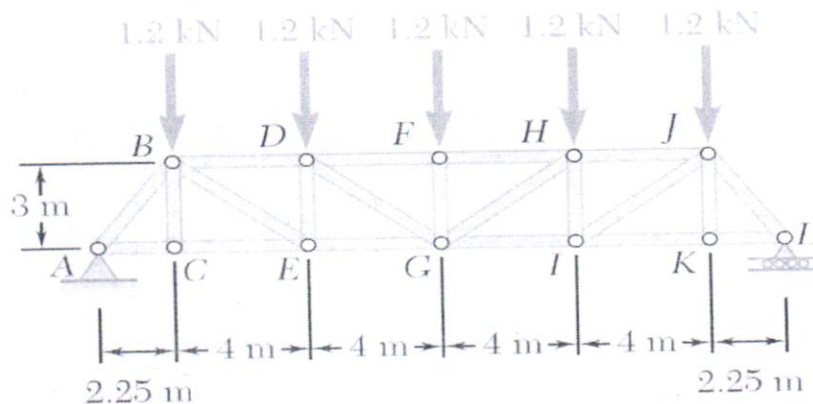
SECTION "B"

Attempt ALL Questions. Assume suitable data if necessary.

1. Three cables are used to tether a balloon as in figure. Determine the Vertical force "P" exerted by the balloon at "A" knowing that the tension in the cable AB is 481 N. [4]



2. For the Given 2D Truss, Determine and present all the member forces (with nature) in a table. [10]

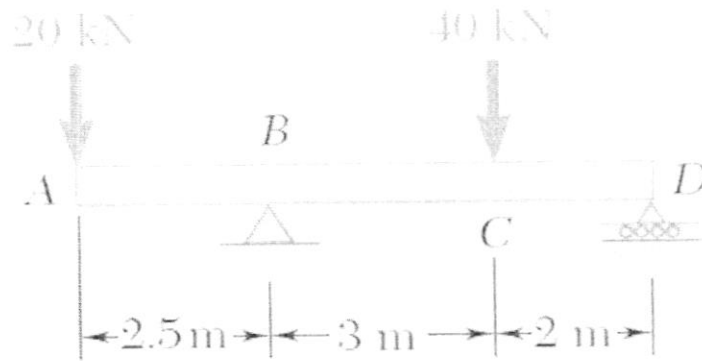


3. The position of a particle moving along a straight line is defined by the relation $x = t^3 - 6t^2 - 15t + 40$, where x is expressed in feet and t in seconds. [4]

Determine:

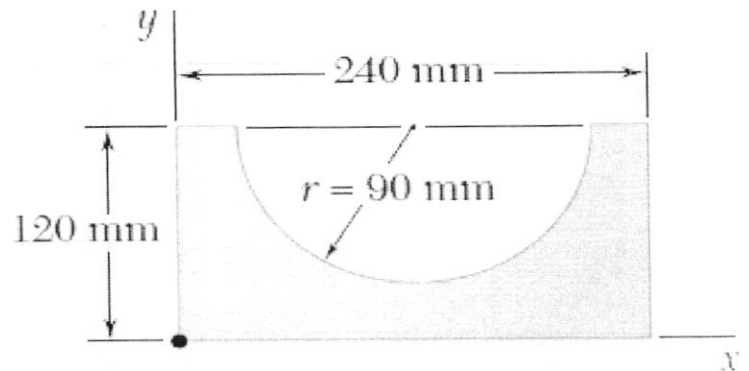
- The time at which the velocity is zero
- The position and distance travelled by the particle at that time
- The acceleration of the particle at that time
- Distance travelled by the particle from $t = 4$ to $t = 6$ seconds.

4. Draw Shear Force Diagram (SFD) and Bending Moment Diagram (BMD) of the given beam showing important points and salient features. [3+3=6]

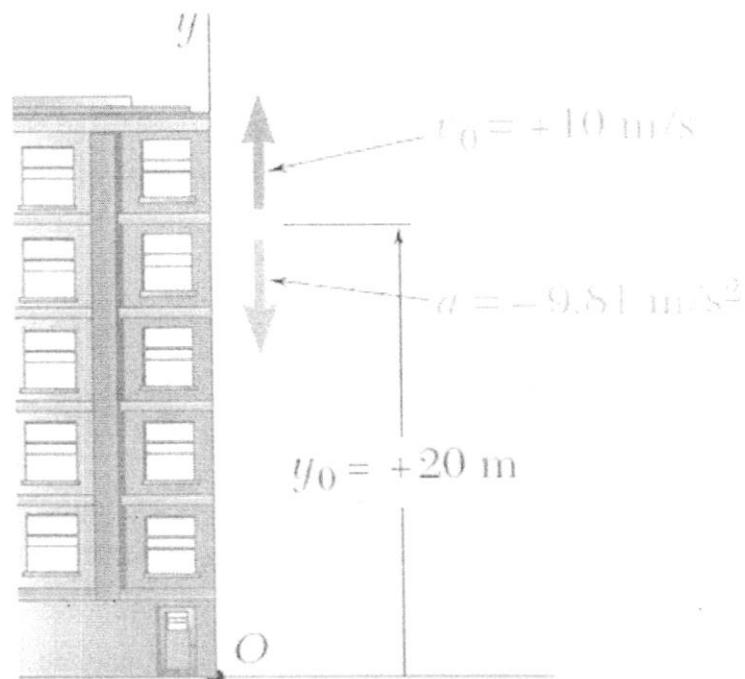


5. For the Given Area Determine:

- The centroid of the shaded area [3]
- Determine the moment of inertia and the shaded area with respect to the shown x-axis. [4]



6. You throw a ball vertically upward with a velocity of 10 meter per second from a window located 20 meter above the ground. Knowing that the acceleration of the ball is constant and equal to $9.81 \text{ (m/s}^2\text{)}$ downward, determine:
- The highest elevation reached by the ball and the corresponding value of time. [3]
 - The time when the ball hits the ground and the corresponding velocity. [3]



7. With the help of example briefly about rectilinear motion and curvilinear motion. [3]