2. SURPRIZE WRITTEN TEST

Subject: Strength Of Materials (SOM)

Subject Code: BCV301

Sem & Sec: 3rd, Section: A

Objective: To involve students to understand and learn the concept effectively.

Topics Covered: Torsion of Shafts, Bending and shear stresses in beams, deflection in beams

Conduction Date: 28th November 2024.

Course faculty: Dr. SHASHI KUMAR A, Associate Professor, CED.

Description: Surprise Written test is one of the assessment methods that describe the following:

- Announced a "surprise test" to students to reduce anxiety while still encouraging consistent preparation.
- Students were given individual descriptive question randomly.
- Ten-minute time given to answer the question.
- Answers scripts were evaluated by course coordinator.
- Highest marks scorer and the student who is first to solve was complimented.

Outcomes:

1. Reinforced Learning:
- Surprise tests can encourage students to stay consistently engaged with course material, fostering continuous learning rather than cramming.

2. Identification of Knowledge Gaps:
- These tests help both students and instructors identify weak areas in understanding, enabling targeted improvement.

3. Improved Time Management:
- Students who experience surprise tests may learn to allocate their study time more effectively across subjects.

4. Encouragement for Regular Study:
- The possibility of surprise tests can motivate students to regularly review and stay up-to-date with the curriculum.

5. Critical Thinking under Pressure:
- Surprise tests often assess problem-solving skills and adaptability, which are crucial in engineering.

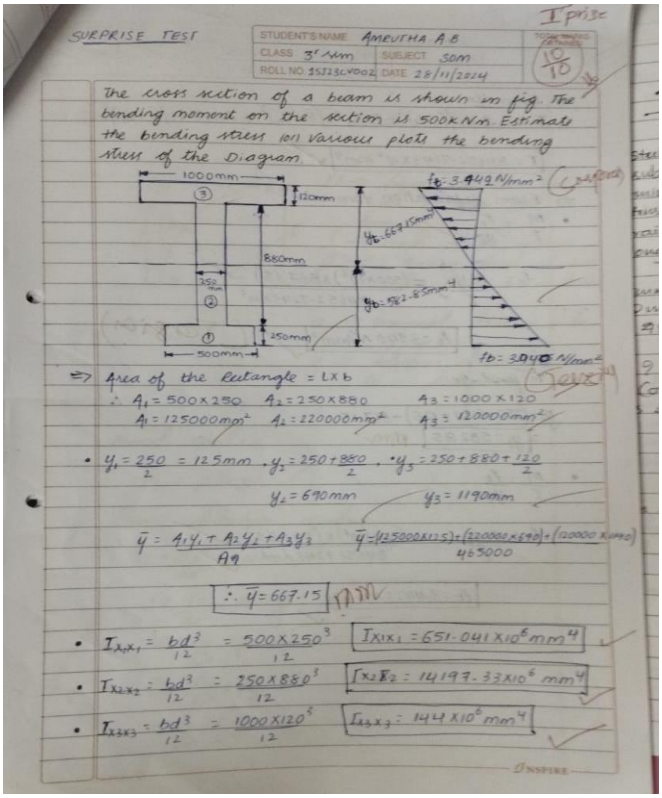
Winner Group: Amrutha A B (1SJ23CV002) and Hemanth G (1SJ23CV013) won the prize

To fill Curriculum Gap, the CO attained are:

CO3: Determine the torsion in circular shafts

CO4: Determine the shear & bending stresses of the beams & the buckling load for columns and struts by Euler's Theory and by Rankine's-Gordons formula for columns

SAMPLE COPY OF ANSWER SCRIPTS OF “SURPRIZE WRITTEN TEST ACTIVITY”



SURPRISE TEST

STUDENT'S NAME: AMRUTHA A B
CLASS: 3rd Sem | SUBJECT: SOM
ROLL NO: 1SJ23CV002 | DATE: 28/11/2024

The cross section of a beam is shown in fig. The bending moment on the section is 500 kNm. Estimate the bending stress on various plate the bending stress of the Diagram

1000mm, 120mm, 880mm, 250mm, 500mm

$f_t = 3.940\ N/mm^2$ (Tension)

$f_b = 3.940\ N/mm^2$

⇒ Area of the Rectangle = L x b

$\therefore A_1 = 500 \times 250 \quad A_2 = 250 \times 880 \quad A_3 = 1000 \times 120$

$A_1 = 125000\ mm^2 \quad A_2 = 220000\ mm^2 \quad A_3 = 120000\ mm^2$

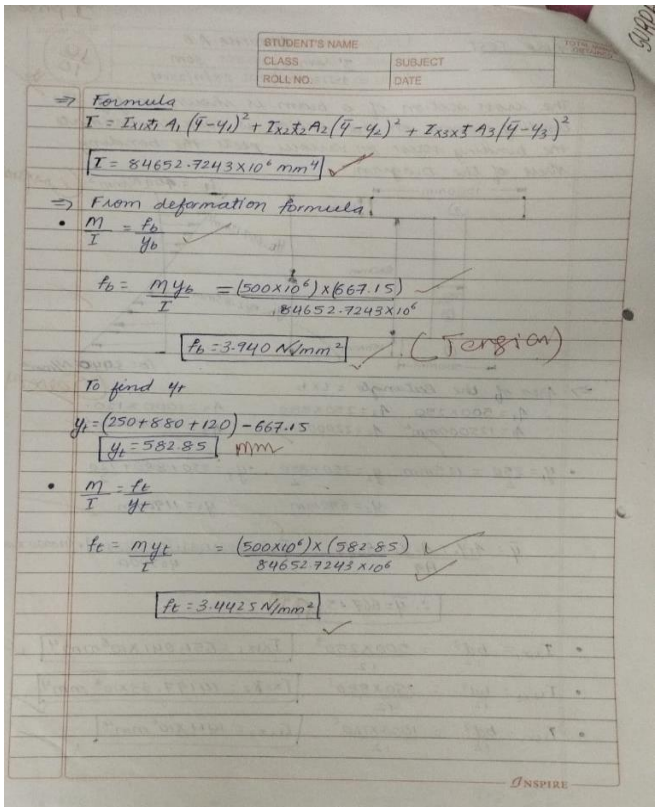
$y_1 = \frac{250}{2} = 125\ mm \quad y_2 = 250 + \frac{880}{2} \quad y_3 = 250 + 880 + \frac{120}{2}$

$y_2 = 690\ mm \quad y_3 = 1190\ mm$

$\bar{y} = \frac{A_1y_1 + A_2y_2 + A_3y_3}{A_9} \quad \bar{y} = \frac{(125000 \times 125) + (220000 \times 690) + (120000 \times 1190)}{465000}$

$\therefore \bar{y} = 667.15\ mm$

- $I_{x_1x_1} = \frac{bd^3}{12} = \frac{500 \times 250^3}{12} \quad I_{x_1x_1} = 651.041 \times 10^6\ mm^4$
- $I_{x_2x_2} = \frac{bd^3}{12} = \frac{250 \times 880^3}{12} \quad I_{x_2x_2} = 14197.33 \times 10^6\ mm^4$
- $I_{x_3x_3} = \frac{bd^3}{12} = \frac{1000 \times 120^3}{12} \quad I_{x_3x_3} = 144 \times 10^6\ mm^4$



STUDENT'S NAME:
CLASS: | SUBJECT:
ROLL NO: | DATE:

⇒ Formula

$I = I_{x_1x_1} + A_1(\bar{y} - y_1)^2 + I_{x_2x_2}A_2(\bar{y} - y_2)^2 + I_{x_3x_3}A_3(\bar{y} - y_3)^2$

$I = 84652.7243 \times 10^6\ mm^4$

⇒ From deformation formula;

- $\frac{M}{I} = \frac{f_b}{y_b}$

$f_b = \frac{My_b}{I} = \frac{(500 \times 10^6) \times (667.15)}{84652.7243 \times 10^6}$

$f_b = 3.940\ N/mm^2$ (Tension)

To find y_t

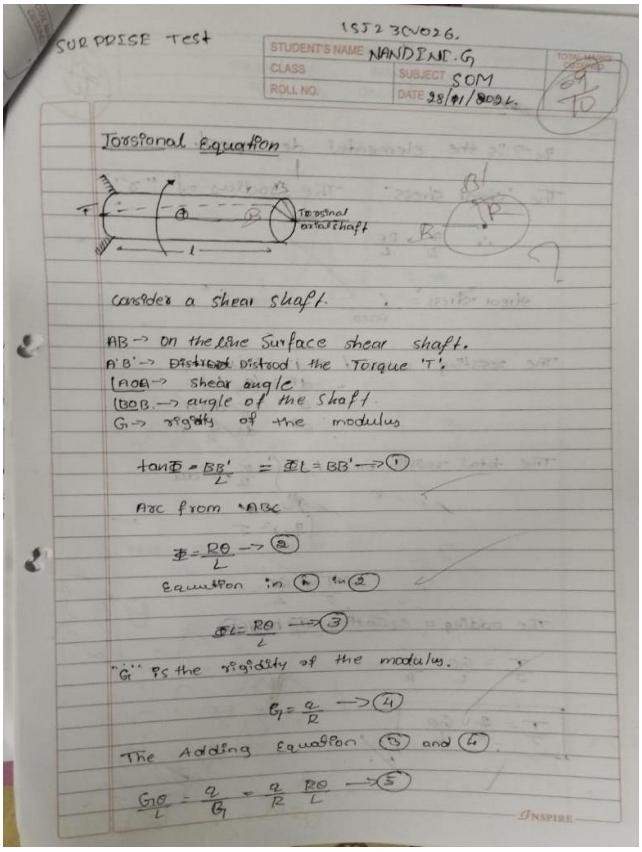
$y_t = (250 + 880 + 120) - 667.15$

$y_t = 582.85\ mm$

- $\frac{M}{I} = \frac{f_t}{y_t}$

$f_t = \frac{My_t}{I} = \frac{(500 \times 10^6) \times (582.85)}{84652.7243 \times 10^6}$

$f_t = 3.4425\ N/mm^2$



SURPRISE TEST

1SJ23CV026.

STUDENT'S NAME: NANDINI. G
CLASS: | SUBJECT: SOM
ROLL NO: | DATE: 28/11/2024

Torsional Equation

Consider a shear shaft.

AB → on the line surface shear shaft.
A'B' → Distroed distrod the Torque 'T'.
∠AOA' → shear angle
∠BOB → angle of the shaft
G → rigidity of the modulus

$\tan\theta = \frac{BB'}{L} = \theta L = BB' \rightarrow (1)$

Arc from ABC

$\theta = \frac{RO}{L} \rightarrow (2)$

Equation in (1) & (2)

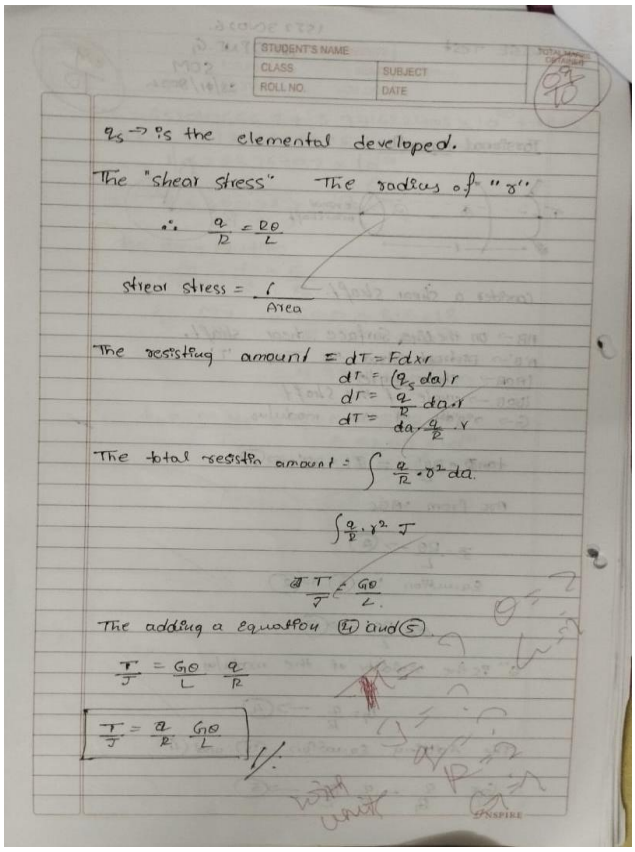
$\theta L = \frac{RO}{L} \rightarrow (3)$

"G" is the rigidity of the modulus.

$G_1 = \frac{q}{R} \rightarrow (4)$

The Adding Equation (3) and (4).

$\frac{G\theta}{L} = \frac{q}{G_1} = \frac{q}{R} \frac{RO}{L} \rightarrow (5)$



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$q_s \rightarrow$ is the elemental developed.

The "shear stress" The radius of "r"

$\therefore \frac{q}{R} = \frac{RO}{L}$

Shear stress = $\frac{f}{\text{Area}}$

The resisting amount = $dT = Fdx r$

$dT = (q_s\, da) r$

$dT = \frac{q}{R} da.r$

$dT = da.\frac{q}{R}.r$

The total resistin amount = $\int \frac{q}{R} \cdot r^2\, da$

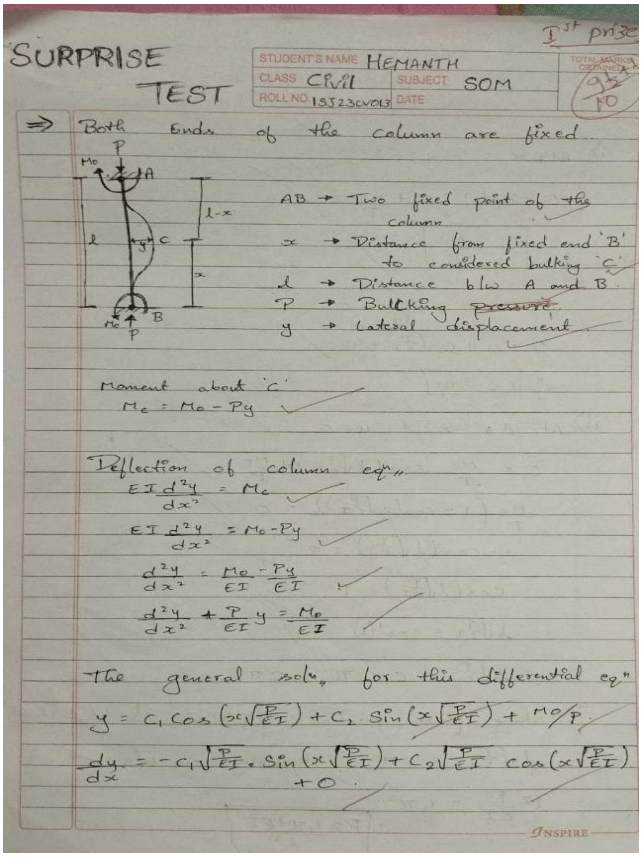
$\int \frac{q}{R} \cdot r^2 J$

$\frac{JT}{J} = \frac{G\theta}{L}$

The adding a equation (1) and (5)

$\frac{T}{J} = \frac{G\theta}{L} \frac{q}{R}$

$\frac{T}{J} = \frac{q}{R} \frac{G\theta}{L}$



SURPRISE TEST

STUDENT'S NAME: HEMANTH
CLASS: Civil SUBJECT: SOM
ROLL NO: 19J23CV013 DATE:

I st prize

⇒ Both Ends of the column are fixed.

AB → Two fixed point of the column
x → Distance from fixed end 'B' to considered bulking 'C'
l → Distance b/w A and B
P → Bulcking ~~pressure~~
y → Lateral displacement

Moment about 'C'
$M_c = M_o - Py$

Deflection of column eqn"
$EI\frac{d^2y}{dx^2} = M_c$

$EI\frac{d^2y}{dx^2} = M_o - Py$

$\frac{d^2y}{dx^2} = \frac{M_o}{EI} - \frac{Py}{EI}$

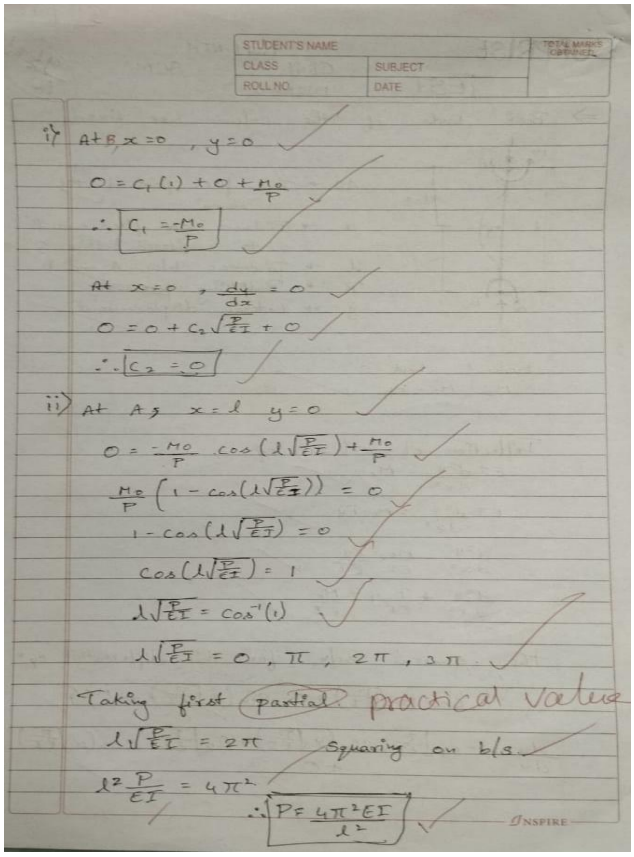
$\frac{d^2y}{dx^2} + \frac{P}{EI}y = \frac{M_o}{EI}$

The general solu" for this differential eq"

$y = C_1\cos\left(x\sqrt{\frac{P}{EI}}\right) + C_2\sin\left(x\sqrt{\frac{P}{EI}}\right) + M_o/P$

$\frac{dy}{dx} = -C_1\sqrt{\frac{P}{EI}}\cdot\sin\left(x\sqrt{\frac{P}{EI}}\right) + C_2\sqrt{\frac{P}{EI}}\cos\left(x\sqrt{\frac{P}{EI}}\right) + 0$

INSPIRE



STUDENT'S NAME
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ROLL NO. DATE

i) At B, $x = 0$, $y = 0$

$0 = C_1(1) + 0 + \frac{M_o}{P}$

$\therefore C_1 = -\frac{M_o}{P}$

At $x = 0$, $\frac{dy}{dx} = 0$

$0 = 0 + C_2\sqrt{\frac{P}{EI}} + 0$

$\therefore C_2 = 0$

ii) At A, $x = l$ $y = 0$

$0 = -\frac{M_o}{P}\cos\left(l\sqrt{\frac{P}{EI}}\right) + \frac{M_o}{P}$

$\frac{M_o}{P}\left(1 - \cos\left(l\sqrt{\frac{P}{EI}}\right)\right) = 0$

$1 - \cos\left(l\sqrt{\frac{P}{EI}}\right) = 0$

$\cos\left(l\sqrt{\frac{P}{EI}}\right) = 1$

$l\sqrt{\frac{P}{EI}} = \cos^{-1}(1)$

$l\sqrt{\frac{P}{EI}} = 0, \pi, 2\pi, 3\pi$

Taking first partial practical value

$l\sqrt{\frac{P}{EI}} = 2\pi$ Squaring on b/s

$l^2\frac{P}{EI} = 4\pi^2$

$\therefore P = \frac{4\pi^2 EI}{l^2}$

INSPIRE

PHOTO GALLARY OF SURPRISE TEST ACTIVITY


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