TOPIC
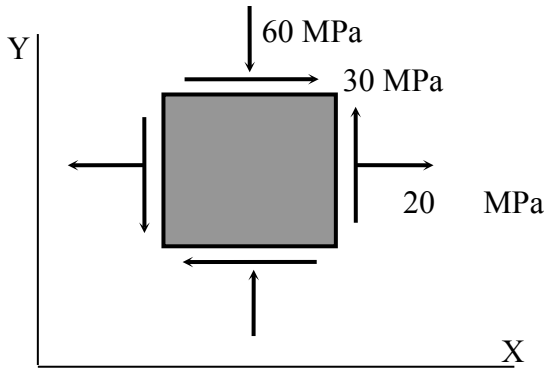Strength of Materials – Section VIII – Question 7

QUESTION
The maximum tensile principal stress in MPa for the two dimensional stress state given is

(A) 20
(B) 30
(C) 40
(D) 60

HINT
A normal compressive stress in the *y*-direction of 60 MPa is a negative stress.

SOLUTION

$$\sigma_x = 20\text{MPa}, \sigma_y = -60\text{MPa}, \tau_{xy} = 30\text{MPa}$$

$$\sigma_{M,m} = \frac{\sigma_x + \sigma_y}{2} \pm \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2}$$

$$\sigma_{M,m} = \frac{20 + (-60)}{2} \pm \sqrt{\left(\frac{20 - (-60)}{2}\right)^2 + 30^2}$$

$$\sigma_{M,m} = -20 \pm 50$$

$$\sigma_{M,m} = 30, -70$$

The maximum principal stress is

$$\sigma_M = 30 \text{ MPa}$$

ANSWER
(B)

CONTRIBUTOR
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