

Stresses

$$y = \sin$$

$$x = \cos$$

1 Calculate the stress on the ground surface exerted by an Elephant Bull

3

You may assume that:-

- I. The mass of the bull is 6 metric tonnes
- II. The imprint of the spoors is roughly circular with diameter of 25 cm
- III. When walking he lifts two legs at a time

What other assumption are you making?

1

2 Calculate the stress on the ground surface exerted by a lady wearing high heeled shoes

3

You may assume that:-

- I. The mass of the lady is 70 kg
- II. The imprint of the heels is roughly square with dimensions 5x5 mm
- III. When walking she lifts one leg at a time and the total weight rests momentarily on the heels

What other assumption are you making?

1

3 A force F1 of magnitude 200 kN acts on a surface of 200 mm x 300 mm at an angle to the surface of 60°

A second force F2 of magnitude 150 kN acts on the same surface at an angle to the surface of 45°

Note:- The components of the forces parallel to the surface oppose each other

You may assume that the forces are uniformly distributed

Calculate:-

3a The magnitude of the resultant force and its direction (show sketch)

3b The normal stress and the shear stress caused by the forces

4 During a triaxial compression test stresses of 100 MPa (in axial direction) and 20 MPa (in circumferential direction) are applied

4a Calculate the normal and shear stresses on a plane at 30° to axis

4b At what angle will the shear stress be the maximum?

4

2

5a Estimate the Vertical Stress to be expected at a depth below surface of 1000 m

3

5b List the assumptions you are making

3

6 Estimate the Horizontal Stress to be expected at a depth below surface of 1000 m

6a At least 2 different methods

Method 1

3 2

6b estimate horizontal stress in the ocean 1000 m

Method 2

3 2

6c List the assumptions you are making for both methods

Method 1

3 1

6d

Method 2

3