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INTERNATIONAL CENTRE FOR APPLIED SCIENCES
(MAHE, MANIPAL)
I SEMESTER B.Sc. (Applied Sciences) in Engg.
End – Semester Theory Make-up Examinations – March. 2022
SUBJECT: MECHANICS OF SOLID (ICE 111)
(Branch: Common to all)

Time: 3 Hours **Date: Tuesday, 22 March 2022** **Max. Marks: 50**

- ✓ **Answer All questions.**
- ✓ **All questions carry equal marks.**
- ✓ **Missing data, if any, may be suitably assumed.**
- ✓ **Draw neat sketches wherever necessary.**

1A. Determine the magnitude and direction of resultant of forces shown in figure.

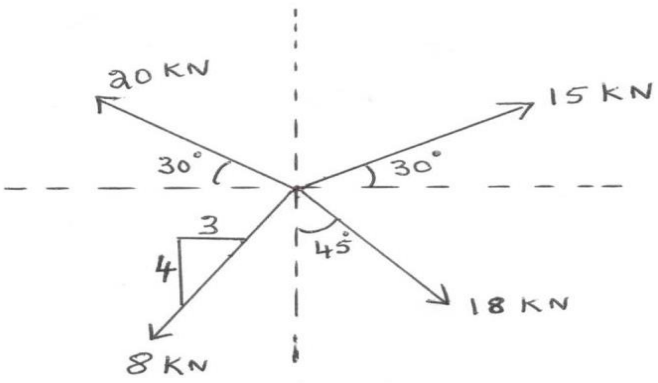

FIG. Q.NO. 1A

1B. Determine the magnitude of horizontal force 'P' to be applied on the ladder as shown in the figure to prevent it from slipping. Consider the coefficient of friction between wall and ladder as 0.3 and that between ground and ladder as 0.5.

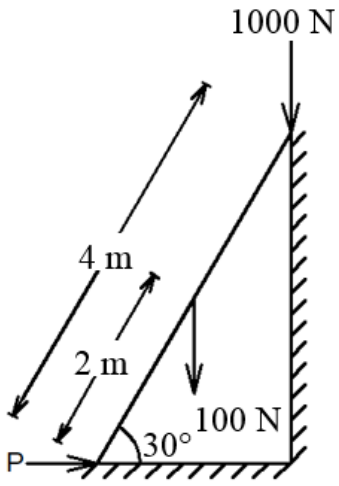

FIG. Q.No. 1B

2A. Define the FOUR common elastic constants.

2B. Determine the position of centroid of the hatched portion with respect to axis AB.

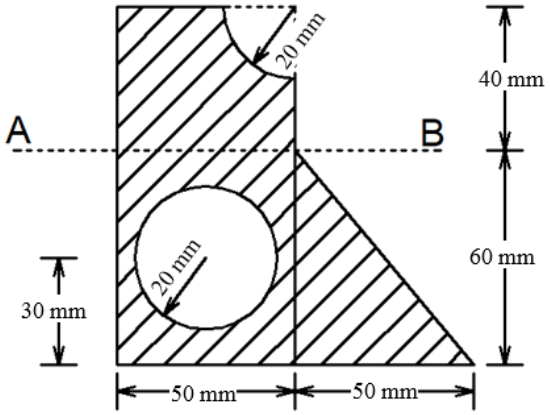

FIG. Q.No. 2B

3A. Explain with sketches (i) Angle of friction (ii) Temperature stress (iii) Compound bar.

3B. A compound tube consists of a steel tube 200 mm in internal diameter and 10 mm thickness and an outer brass tube 220 mm internal diameter and 10 mm thickness. The two tubes are of same length. The compound tube carries an axial load of 1500 kN. Find the stresses and the loads transmitted to the two tubes. Take E_{Steel} = 200 GPa and E_{Brass} = 100GPa.

4A. Locate the resultant of the non-concurrent force system shown in the figure with respect to 'A'.

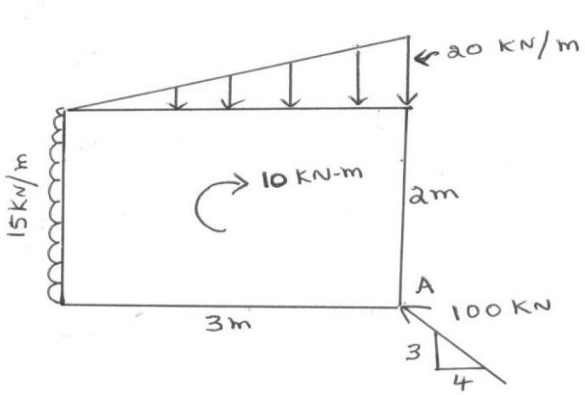

FIG. Q.No. 4A

4B. Determine the velocity of block B after moving for 4 sec. starting from rest.

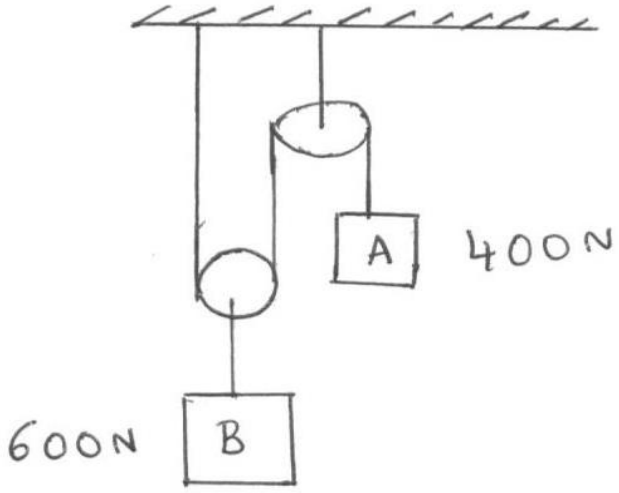

FIG. Q.No. 4B

5A. A boiler shell is to be made of 12 mm thick plate having a limiting tensile stress of 100 N/mm^2. If the efficiencies of the longitudinal and circumferential joints are 60% and 40% respectively determine;

i) The maximum permissible diameter of the shell for an internal pressure of 1.5 N/mm^2.

(ii) Permissible intensity of internal pressure when the shell diameter is 1.2 m.

5B. A metallic bar 400 mm × 120 mm × 60 mm is loaded as shown in the figure. Find the change in each dimension and total volume. Take E = 200GPa, Poisson's ratio, μ = 0.25.

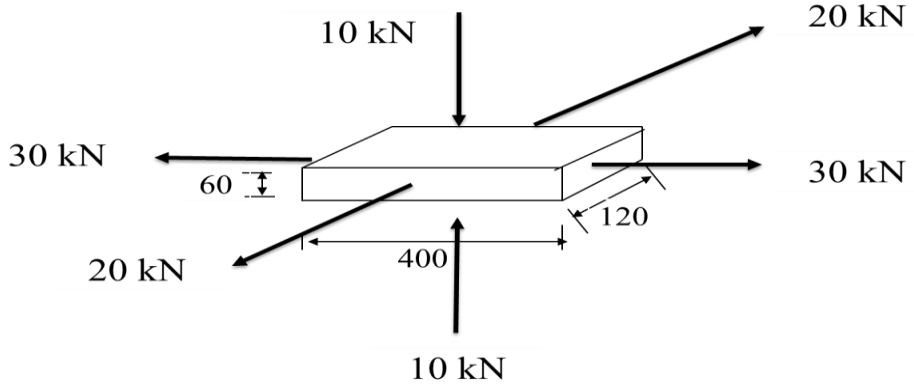

FIG. Q.No. 5B