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T 3117

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2008.

Second Semester

Electrical and Electronics Engineering

CE 1161 — FLUID AND SOLID MECHANICS

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State "Hooke's Law".
2. State the Relationship between young's modulus, modulus or rigidity and bulk modulus?
3. List out the cases of pure bending in beams.
4. List any four assumptions made in theory of simple bending.
5. Write the dimensions for
 - (a) work
 - (b) power
 - (c) energy
 - (d) force.
6. Write the differences between specific weight and specific volume.
7. List out various minor losses in pipes.

8. List out the conditions of boundary layer separation.
9. Define "Specific Speed" of turbine.
10. What is "Cavitation" in pumps? How can you avoid it?

PART B — (5 × 16 = 80 marks)

11. (a) Determine the forces in the truss, shown in the Fig-1.

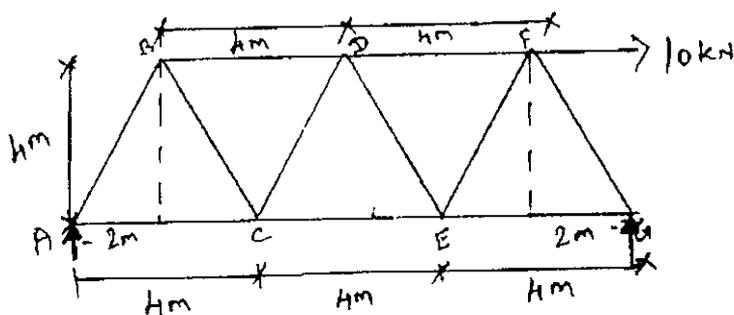


Fig-1

Or

- (b) A brass bar, having cross sectional area of 1000 mm^2 , is subjected to axial forces as shown in Fig-2.

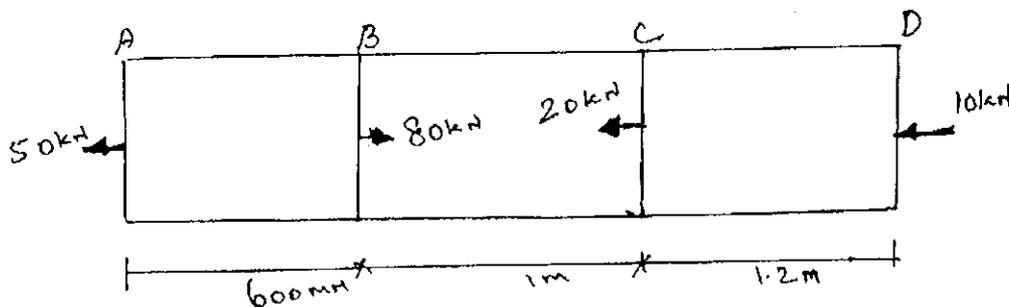


Fig-2

Find the total elongation of the bar. Take $E = 1.05 \times 10^5 \text{ N/mm}^2$.

12. (a) Draw the S.F and B.M diagrams for the beam shown in Fig-3.

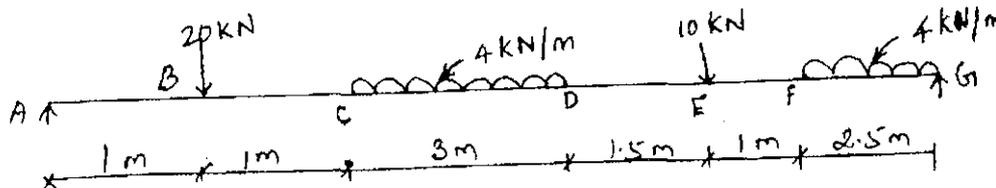


Fig-3

Or

- (b) The stiffness of a closed – coiled helical spring is 1.5 N/mm under a maximum load of 60 N (compression). The maximum shearing stress produced in the wire of the spring is 125 N/mm^2 . The solid length of spring (when the coils are touching) is given as 5cm . Find
- diameter of wire
 - mean diameter of the coils and
 - number of coils required. Take $C = 4.5 \times 10^4 \text{ N/mm}^2$.
13. (a) The dynamic viscosity of an oil used for lubrication between a shaft and sleeve is 6 poise . The shaft is of diameter 0.4 m and rotates at 190 r.p.m . Calculate the power lost in the bearing for a sleeve length of 90 mm . The thickness of oil film is 1.5 mm .

Or

- (b) In a vertical pipe conveying oil of specific gravity 0.8 , two pressure gauges have been installed at A and B where the diameters are 16 cm and 8 cm respectively. A is 2 meters above B. The pressure gauge readings have shown that the pressure at B is greater than at A by 0.981 N/mm^2 . Neglecting all losses, calculate the flow rate. If the gauges at A and B are replaced by tubes filled with the same liquid and connected to a U- tube containing mercury, calculate the difference of level of mercury in the two limbs of the "U"-tube.
14. (a) A crude oil of $\mu = 1.5 \text{ poise}$ and relative density 0.9 flows through a 20 mm diameter vertical pipe. The pressure gauges fixed 20 m apart read 58.86 N/cm^2 and 19.62 N/cm^2 as shown in fig-4. Find the direction and rate of flow through the pipe.

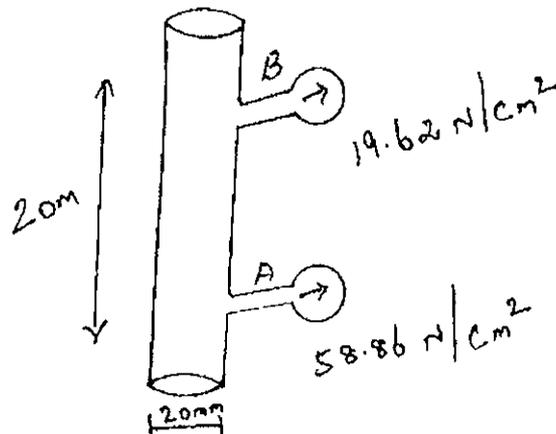


Fig-4

Or

- (b) A horizontal pipe line 40 m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25 cm of its length from the tank, the pipe is 150 mm diameter and its diameter is suddenly enlarged to 300 mm. The height of water level in the tank is 8 m above the centre of the pipe. Considering all losses, determine the rate of flow. Take $f = 0.01$ for both sections of pipe.
15. (a) The penstock supplies water from a reservoir to the Pelton wheel with a gross head of 500 m. One third of the gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of the penstock is $2 \text{ m}^3/\text{s}$. The angle of deflection of the jet is 165° . Determine the power given by the water to the runner and also hydraulic efficiency of the Pelton wheel. Take speed ratio = 0.45 and $C_v = 1.0$.

Or

- (b) A centrifugal pump has following dimensions: inlet radius = 80 mm, outlet radius = 160 mm, width of impeller at the inlet 50 mm. $\beta_1 = 0.45$ radians, $\beta_2 = 0.25$ radians; width of impeller at outlet = 50 mm. Assuming shock less entry, determine the discharge and the head developed by the pump when the impeller rotates at 90 radians/second.
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