



SF-6501

B. E. - II (Sem. IV) (Electrical) Examination
May / June - 2011
Mechanics of Solids & Fluids

Time : 4 Hours]

[Total Marks : 100

Instruction :

(1)

नीचे दृष्टावेक निशानीवाणी विगतो उत्तरवही पर अवश्य कभवी.
Fillup strictly the details of signs on your answer book.

Name of the Examination :
B. E. - 2 (SEM. 4) (ELECTRICAL)

Name of the Subject :
MECHANICS OF SOLIDS & FLUIDS

Subject Code No. : 6 5 0 1 Section No. (1, 2,.....) : NIL

Seat No. :

Student's Signature

- (2) Answers must be written in same answer books.
- (3) Figures to the right indicate full marks.
- (4) Assume any additional data if required and mention it clearly.
- (5) Justify your answer with suitable figure.

- 1 (a) Define following terms : 8
 - (i) Ultimate stress
 - (ii) Failure diagrams of elastic and non-elastic materials.
 - (iii) Gage length and test length
 - (iv) Temperature stress.
- (b) A cylindrical rod with 50 cm diameter is subjected to axial pull of 100 kN. If $E=200 \text{ kN/mm}^2$ and Poisson's ratio = 0.30. Find total change in volume of bar and bulk modulus for the material. 10

- 2 (a) Determine reactions only for the beam shown in fig.1 4

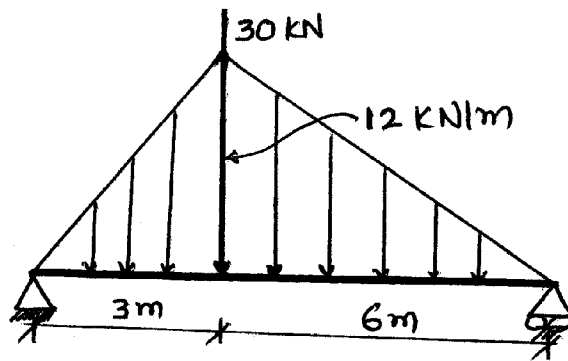


Fig. 1

- (b) For the simply supported beam as shown in **fig. 2** 12
draw shear force and bending moment diagram. Locate
the point where B.M. is maximum.

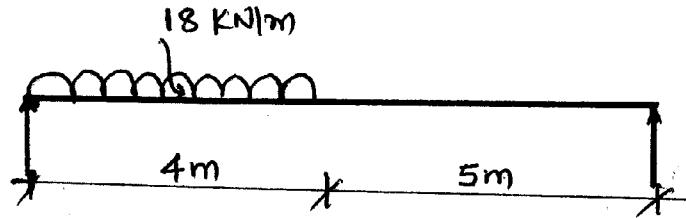


Fig. 2

OR

- (b) A shaft has transmitted 140 Hp at 2 Hz. If the shear 12
stress is not exceed 650 Kg/cm^2 and the twist in a length
of 350 cm must not exceed 1° . Design the shaft take
modulus of rigidity = $8 \times 10^5 \text{ Kg/cm}^2$.
- 3 (a) Explain Fatigue strength, endurance limit of a 4
material and S-N diagram.
- (b) A beam having rectangular cross-section is subjected 12
to shear force of 100 kN. The allowable shear stress in
the material is 30 N/mm^2 . If the beam has depth equal
to 1.5 times its width. Find the cross sectional dimension
for the beam.

OR

- (b) An 'T' beam with cross section as shown in **fig. 3** is 12
simply supported over the full span of 6m. If the
allowable bending stress is 540 Mpa. Determine the safe
intensity of uniformly distributed load it can support on
the full span.

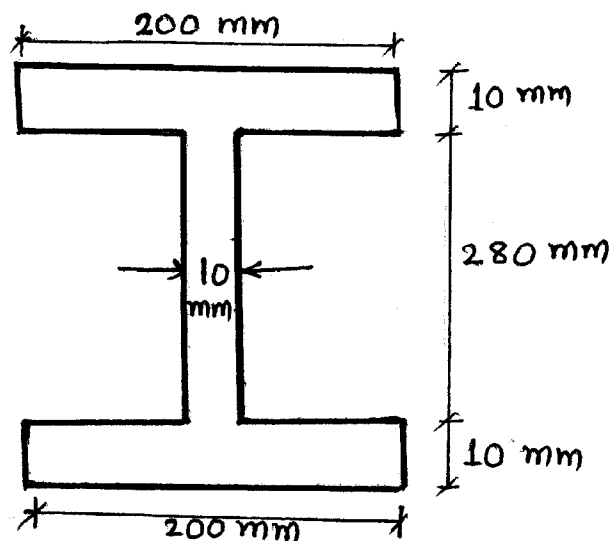


Fig. 3

- 4 (a) Fill in the blanks : 5
- (i) The fluid with no definite volume and is compressible is termed as _____.
 - (ii) Unit of dynamic viscosity is _____.
 - (iii) Specific volume is ratio of _____ to _____.
 - (iv) The formula for the head developed by a centrifugal pump is _____.
 - (v) Phenomenon of rise or fall of a liquid surface in a small tube is called _____.
- (b) Explain velocity potential and stream function. 5
- (c) In the **fig. 4** an inverted differential manometer is connected to two pipes A and B which convey water. The fluid in manometer is oil of specific gravity 0.7. For the manometer headings shown in the fig. find the pressure difference between A and B. 6

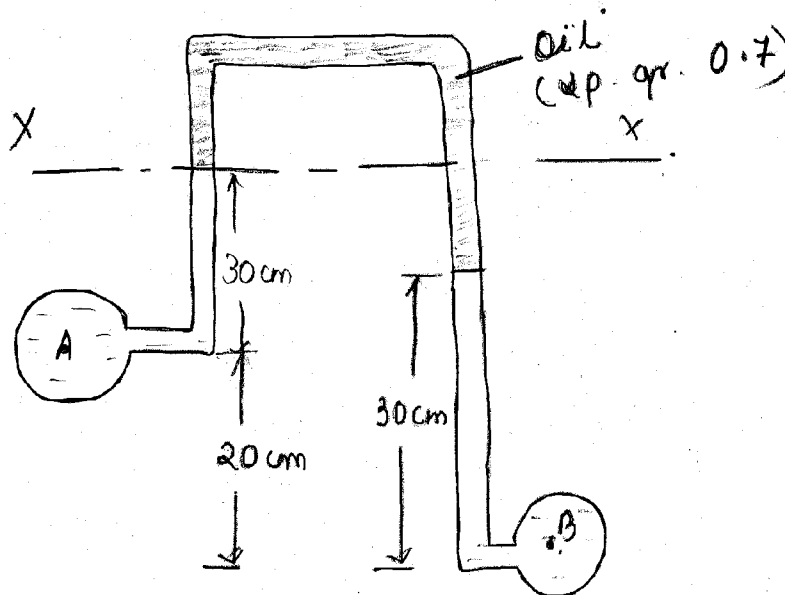


Fig. 4

- 5 (a) Derive the expression for the rate of flow through a triangular notch or weir. 10
- (b) Determine the height of a rectangular weir of length 6m to be built across a rectangular channel. The maximum depth of water on the upstream side of the weir is 1.8 m and discharge of 2000 lit/s. Take $C_d = 0.6$ and neglect end contractions. 8

OR

- 5 (a) Water is flowing through a pipe of diameter 200 mm with a velocity of 3 m/s. Find the head lost due to friction for a length of 5m if the coefficient of friction is given by $f = 0.002 + 0.09/R_e^{0.3}$, where R_e is Reynold number. The kinematic viscosity of water = 0.01 stoke. 8
- (b) Define impulse turbine and reaction turbine. 10
A pelton wheel is having a mean bucket diameter of 1m and is running at 1000 rpm. The net head on the pelton wheel is 700 m. If the side clearance angle is 15° and discharge through nozzle is $0.1 \text{ m}^3/\text{s}$, find :
(i) Power available at the nozzle and
(ii) Hydraulic efficiency of the turbine.
- 6 Write any four : 16
- (i) Flow through pipe is parallel
(ii) Pitot tube
(iii) One dimensional, two dimensional flow.
(iv) Capillarity and surface tension
(v) Working of a centrifugal pump.
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