Total No. of Questions – [6] Total No. of Printed Pages: 4

G.R. No.	

Paper Code - U239-113(ESE)

DECEMBER 2019 ENDSEM EXAMINATION

S. Y. B.TECH. (Civil Engineering) (SEMESTER-III)

COURSE NAME: Mechanics of structures - I

COURSE CODE:CVUA21183

(PATTERN 2018)

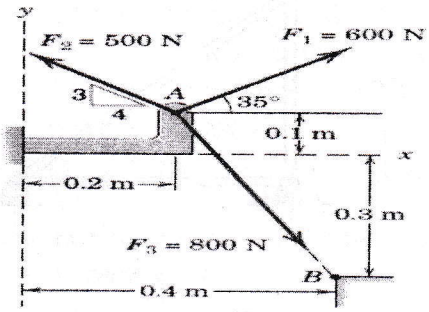
Time: [2 Hours] **Max. Marks**:[50]

Instructions to candidates:

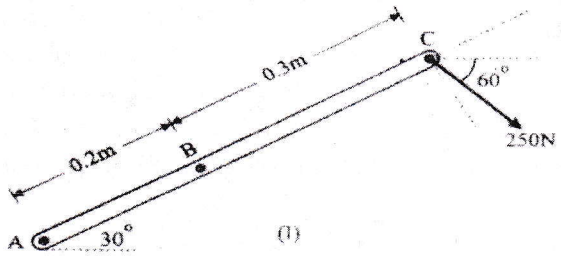
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of scientific calculator is allowed.
4) Assume suitable data where ever required.

Q.1) Attempt any **one**

a) The forces F_1, F_2, and F_3 act at point A as shown below. Determine magnitude of their resultant. (Angle made by 800 N with horizontal $= 26.56^0$) [4]

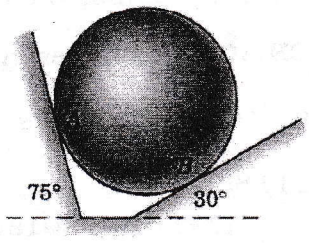


b) Find moment of 250 N force about point 'A' and about point 'B'. [4]

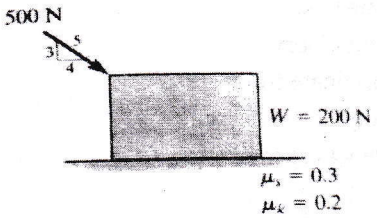


Q.2) Attempt any **one**

a) The 20 kg homogeneous smooth sphere rests on the two inclines as shown in fig. Determine reactions at A and B. [4]

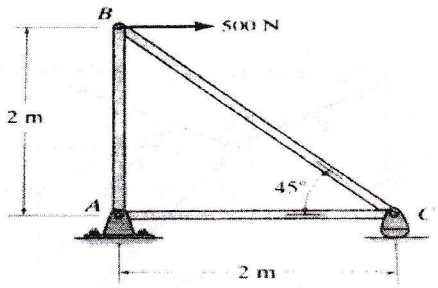


b) Determine the frictional force at the surface of contact. [4]



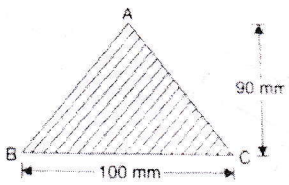
Q.3) Attempt any **one**

a) Evaluate the forces and nature in each member of the truss as shown below. [6]



b) Define the term- moment of inertia. [6]

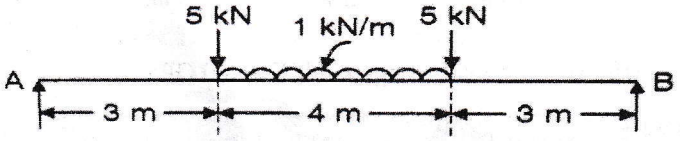
Find the moment of inertia of the section about an axis passing through the base Bc , centroidial axis and line parallel to base at apex A.



Q.4) Attempt any **one**

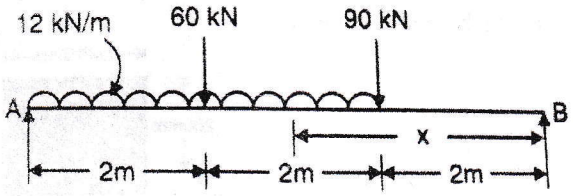
a) Define the terms 'shear force' and 'bending moment'. How are they considered positive and negative? [10]

A beam AB 10m long is loaded as shown in figure; apply equilibrium equations to find SF and BM. Draw SFD and BMD.



b) What do you mean by point of contraflexure? [10]

A 6m long simply supported beam is loaded as shown in figure. Applying the conditions of equilibrium determine SF and BM, draw SFD and BMD. Mark The maximum values.



Q.5) Attempt any **one**

a) **i)**When a steel tube of external diameter 30 mm and internal diameter 20 mm was subjected to an axial load of 30 kN, the extension on gauge length of 80 mm was 0.07 mm and decrease in outer diameter was 0.006 mm. Find Young's modulus of elasticity, Poisson's ratio and change in volume. [7+6]

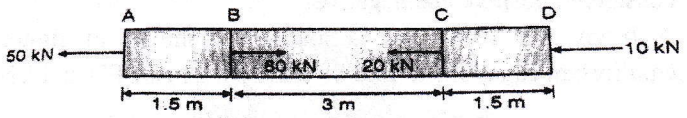
Assume length of tube = 800mm.

ii) A mild steel specimen was tested in tension using U.T.M. and the following observations were recorded.

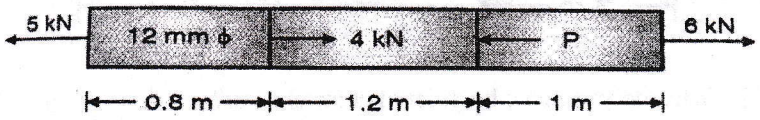
1) Diameter of rod = 10 mm.
2) Length of specimen = 200 mm
3) Extension under a load of 5.3 kN= 0.064 mm
4) Load at yield point= 20 kN
5) Maximum load= 33 kN
6) Length of the specimen after fracture= 250mm.

Determine- Young's Modulus, yield stress, Ultimate stress, percentage elongation, and the working stress if factor of safety is 2.0

b) **i)** Steel member AD of 800 mm^2 cross-sectional area is subjected to axial forces as shown below. Find total change in length of the member. Take E = 200 GPa. [7+6]

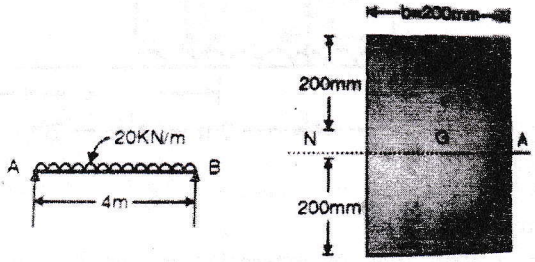


ii) Determine P and total elongation if E = 200 GPa.



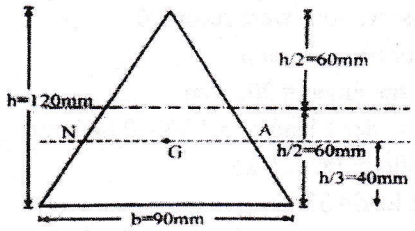
Q.6) Attempt any **one**

a) **i)** A simply supported beam of span 4m is subjected to a udl of 20 kN/m over entire span. Determine maximum bending stress, if X-section of the beam is 200 x 400mm [7+6]



ii) Describe the concept of pure bending, state any four assumptions made in the theory of pure bending.

b) **i)** A beam of triangular section has a base 90mm and height 120mm. If the section is subjected to a S. F. of 20 kN, find average and maximum shear stress induced also sketch the shear stress distribution diagram along the depth of the beam, indicating the values at controlling points. [7+6]



ii) Draw shear stress distribution diagram for following sections: square, channel, unsymmetrical I, solid circular.