P P SAVANI UNIVERSITY

Second Semester of B. Tech. Examination

May 2022

SECV1080 Mechanics of Solids

01.06.2022, Wednesday **Time: 10:00 a.m. To 12:30 p.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1 **Answer the following (Any Four)** **[04]**

(i) Define the co-planner force system.

(ii) State the law of triangulation.

(iii) Write down an equation for M.I of a triangle of base (b) and height (h) about an axis passing through the apex and parallel to the base.

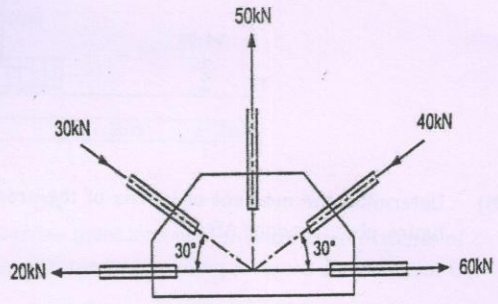
(iv) What is the difference between scalar and vector quantities?

(v) Given two forces of magnitude 10 KN and 20 KN, are having a resultant of 15 KN. Find the angle between two forces.

(vi) What will be the centroid of the quarter circle?

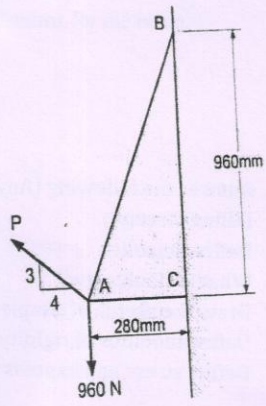
Q - 2 (a) A boat B is in the middle of a canal 100m wide and is pulled by two ropes BA 150m long and BC 100m long by two locomotives on the banks. Pull in BC being 1500N. Find the pull in BA so that the boat moves parallel to the banks. Find also a resultant force on the boat. **[06]**

Q - 2 (b) In a truss members following forces are acting. Calculate the resultant force on truss joint. **[05]**



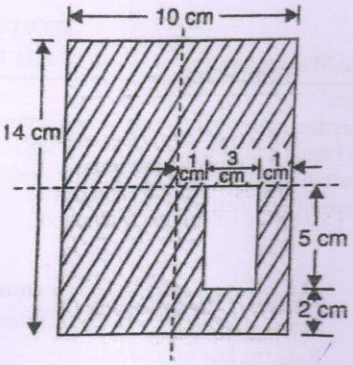
OR

Q - 2 (a) Two cables AB and AC are tied together at A and loaded as shown in the figure. Knowing that P= 640kN, determine the tension in each cable. **[06]**



Q - 2 (b) State and Derive Law of a parallelogram. [05]

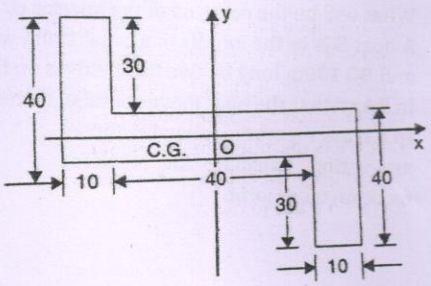
Q - 3 (a) From a rectangular lamina ABCD 10cm X 14cm a rectangular hole of 3cm X 5cm is cut as shown in the figure, find the centre of gravity of the remaining lamina. [07]



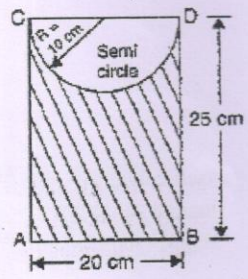
Q - 3 (b) A bar of 40mm diameter is subjected to a pull of 100 kN. The measured extension on gauge length of 200 mm is 0.1 mm and change in diameter is 0.005 mm. calculate: [08]
(a) Young's modulus (b) Poisson's ratio (c) Bulk modulus

OR

Q - 3 (a) For the section shown in figure, determine M.I about its centroid along (x,y) axis. All dimensions are in cm. [07]



Q - 3 (b) Determine the moment of inertia of the area shown in figure, about its edge AB. [08]



SECTION – II

Q - 1 Answer the following (Any Four) [04]

(i) Define Strength.

(ii) Define Ductility.

(iii) What is Hook's law?

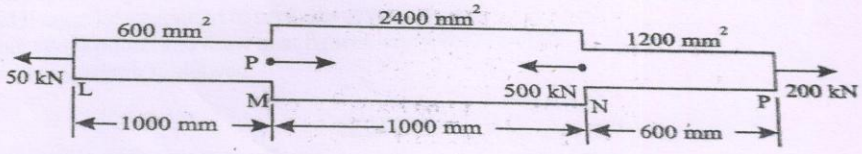
(iv) Draw the sketch of simple supported beam with uniformly varying load.

(v) Define modulus of rigidity.

(vi) Define stress and express the unit of it.

Q - 2 (a) A cantilever of length 2.0 m carries a uniformly distributed load of 1 kN/m run over a length of 1.5 m from the free end. Draw the shear force and bending moment diagrams for the cantilever. **[06]**

Q - 2 (b) A steel bar LMNP is subjected to forces as shown in Fig. Find elongation of the bar. Take E= 200 Gpa. **[05]**



OR

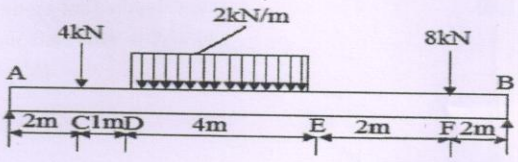
Q - 2 (a) A cantilever of length 4 m carries a gradually varying load, zero at the free end to 2 kN/m at the fixed end. Draw the S.F. and B.M. diagram for the cantilever. **[06]**

Q - 2 (b) A gun metal rod 20mm diameter, screwed at the ends, passes through a steel tube 25 mm and 30 mm internal and external diameters. The nuts on the rod are screwed tightly on the ends of the tube. Find the intensity of stress in each metal, when the common temperature rises by 200°F. Take **[05]**

$\alpha_s = 6 * 10^{-6}/°F, \alpha_g = 10 * 10^{-6}/°F, E_s = 200\ GPa, E_g = 100 GPa$

Q - 3 (a) Derive an equation for finding out the stress in circular tapering bar. **[07]**

Q - 3 (b) Draw S.F & B.M diagram for a beam shown in fig. **[08]**



OR

Q - 3 (a) A simply supported beam of length 6m, carries point load of 3 kN and6 kN at distance of 2 m and 4m from the left end. Draw the shear force and bending moment diagrams for the beam. **[07]**

Q - 3 (b) A simply supported beam of length 5 m carries a uniformly increasing load of 800 N/m run at one end to 1600 N/m run at the other end. Draw S.F & B.M. diagrams for the beam. **[08]**

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