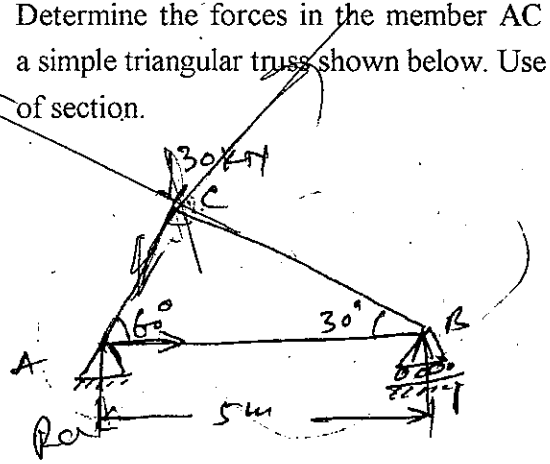
(c) Determine the forces in the member AC and AB of a simple triangular truss shown below. Use the method of section.



5 Attempt any two parts of the following : 10×2=20

(a) Define Hooke's Law. Derive the relation between elastic caustal E, K and G.

where E = Youngs modulus

K = Bulk Modulus

G = Modulus of rigidity

(b) At a point in a beam section, the stress is 50 MPa tensile and shear stress is 20 MPa. Determine

(i) The principal stresses and maximum shear stress

(ii) The shear stress which acting along would produce the same maximum principal stress as in (i)

(c) Derive the equation of torsion

$$\frac{T}{I_p} = \frac{F_s}{R} = \frac{G\theta}{l}$$

where the terms have their usual meaning.

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Paper ID and Roll No. to be filled in your Answer Book

Roll No.

B. Tech.

(SEM. II) EXAMINATION, 2011

MECHANICAL ENGINEERING

Time : 3 Hours] [Total Marks : 100

Note : Attempt all questions.

1 Attempt any four parts of the following : 5×4=20

(a) What do you understand by 'system' ? What are the types of system ? Explain giving examples of each.

(b) Define state, property and process. Explain the concept of cyclic process.

(c) Explain the difference between path and point function. Define thermodynamic work and prove that it is a path function.

(d) Classify the following properties of the system whether they are intensive or extensive ?

(i) Mass

(ii) Weight

(iii) Volume

(iv) Velocity

(v) Density

(e) What are the different forms of energy ? Derive equation for internal energy of a system.

(f) Differentiate between reversible and irreversbile process.

2 Attempt any four parts of the following : 5×4=20

(a) Show that the internal energy of the system is the property of system and it does not depend upon the path.

(b) Explain the zeroth law of thermodynamics and indicate how it helps to introduce the concept of temperature.

(c) A closed system undergoes a reversible process at constant pressure process of 3.5 bar and its volume changes from 0.15 m^3 to 0.06 m^3. 25 kJ of heat is rejected by the system during the process. Determine the change in internal energy of the system.

(d) Give the following statements of the second law of thermodynamics :

(i) Kelvin-Planck statement

(ii) Classius statement

(e) Define heat engine, refrigerator and heat pump. Explain C.O.P.

(f) What is thermodynamic temperature scale ? Prove that absolute zero cannot be attained.

3 Attempt any two parts of the following : 10×2=20

(a) Explain the term 'quality of steam'. Differentiate between wet, dry saturated and superheated steam. Describe a method of finding the dryness fraction of steam.

(b) Describe the construction of temperature entropy and Mollier diagrams.

Calculate the quantity of heat required to form 2.5 kg of dry steam at 1.1 MPa from water at 20°C. Also determine the amount of heat removed at constant pressure to cause the steam to become 0.95 dry. Calculate the specific volume of the respective conditions.

(c) Differentiate between two stroke and four stroke cycle engine.

An engine working on ottocycle has temperature of 330° K and 600° K at the beginning and end of compression stroke. Determine the compression ratio and air standard efficiency.

4 Attempt any two parts of the following : 10×2=20

(a) Outline the steps involved in graphical method for the determination of the resultant of forces.

A body weighing 300 m is resting on a rough horizontal table. A pull of 100 M is applied at an angle of 15° with the horizontal just causes the body to slide over the table. Calculate the normal reaction and the coefficient of friction.

(b) Draw the S.F. and B.M. diagrams for a cantilever subjected to U.D.L. over its entire span.