[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2123)

1317

B. Tech 1st Semester Examination

Basic Mechanical Engineering (O.S.)

ME-1003

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, selecting one question from each section A, B, C and D. The section E is compulsory with short answer type and all parts of this section are to be attempted. Missing data, if any, can be assumed suitably. Take r=1.4, R=0.29 KJ/kg ^{o}C, c_v= 0.718

SECTION - A

1. (a) What do you mean by "Perpetual motion machine of first kind"? **(5)**

   (b) Explain the Joule's Law. **(5)**

   (c) Set up a relationships of between the two specific heats. **(10)**

2. (a) A cylinder contains 0.45 m^3 of a gas at 1×10^5 N/m^2 and 80°C. The gas is compressed to a volume of 0.13 m^3, the final pressure being 5×10^5 N/m^2.

   Determine:

   (i) The mass of gas;

   (ii) The value of index of 'n' for compression;

   (iii) The increase in internal energy of gas:

   (iv) The heat received or rejected by the gas during the compression. **(15)**

(b) Explain clearly difference between a non flow & steady flow and Closed & open systems. **(5)**

SECTION - B

3. (a) State the limitations of first law of thermodynamics. **(5)**

   (b) Two Carnot engine works in series between the sources and sink temperatures of 550 K and 350 K. If both engines develop equal power determine the intermediate temperature. **(15)**

4. (a) Prove that that entropy is a 'Property' of a system. **(5)**

   (b) Derive the expressions for entropy changes for a closed system in the following cases:

   (i) Heating of a gas at constant volume;

   (ii) Heating of a gas at constant pressure;

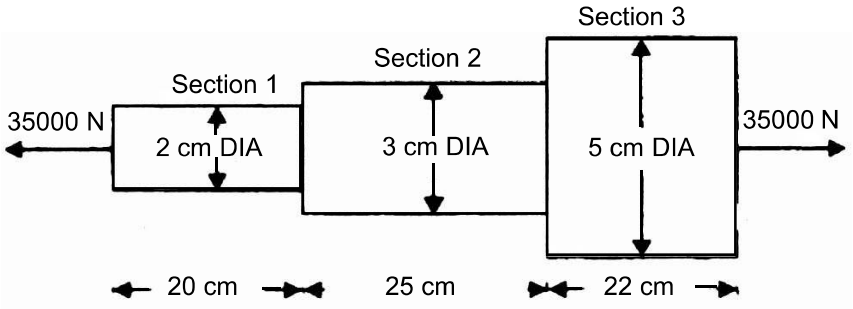
   (iii) For isothermal process. **(15)**

SECTION - C

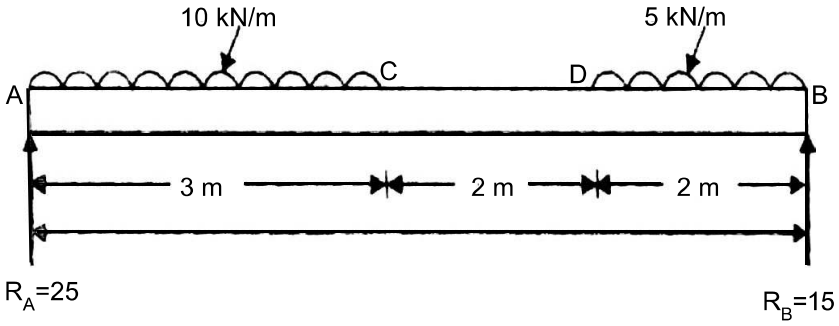
5. An axial pull of 35000 N is acting on a bar consisting of three lengths as shown in Fig. If the Young's modulus 2.1 x 10^5 N/mm^2, determine :

   (i) stresses in each section and

   (ii) Total extension of the bar. **(20)**



6. Draw the S.F. and B.M. diagrams of a simply supported beam of length uniformly distributed loads as shown in figure. **(20)**



SECTION - D

7. Prove that relation:

$$\frac{M}{I}=\frac{\sigma}{y}=\frac{E}{R}$$

Where M = Bending Moment, y=distance from neutral axis

σ=Bending Stress, I = M.O.I., E = Young's Modulus and R = Radius of Curvature **(20)**

8. Two shafts of the same material and of same lengths are subjected to the torque, if the first shaft is of a solid circular section and the second shaft is of hollow section, whose internal diameter is 2/3 of the outside diameter and the maximum stress developed in each shaft is the same, compare the weights of the shafts. **(20)**

SECTION - E

9. (a) Define a process.

(b) Write down steady flow energy equation for a compressor.

[P.T.O.]

(c) Differentiate between the adiabatic and polytrophic processes.

(d) How the efficiency of Carnot engine can be increased?

(e) What is the significance of entropy?

(f) What is the significance of Young's modulus?

(g) What is the uniformly distributed and uniformly varying load?

(h) What are the different types of beams?

(i) Define the pure bending.

(j) What do you mean by section of modulus? **(2×10=20)**