

TME-101

320

Printed Pages : 5

Paper Code & Roll No. to be filled in your Answer Book

Roll No.

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Odd Semester Examination-2016

B.Tech. (Semester-I)**BASIC MECHANICAL ENGINEERING**

[Time : 3 Hours]

[Maximum Marks :100]

Note : Attempt **all** questions. All questions carry equal marks.

Assume missing data suitably.

1. Attempt **any four** parts : [5×4=20]

- (a) What do you mean by thermal equilibrium?
- (b) Explain macroscopic and microscopic view in thermodynamics.
- (c) What do you mean by quasi-static process?
- (d) Explain free expansion process.
- (e) 0.1 m^3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5 m^3 . Calculate the final pressure of the gas and heat supplied during the process.

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(1)

[P.T.O.]

(f) What do you mean by internal energy? Prove that it is a property of system.

2. Attempt **any four** parts : [5×4=20]

(a) Explain steady flow energy equation.

(b) Explain Kelvin-Planck statements of second law of thermodynamics.

(c) 0.5 kg of a perfect gas is heated from 100° C to 300° C at a constant pressure of 2.8 bar. It is then cooled to 100° C at constant volume. Find the overall change in entropy. Take $C_p = 1 \text{ kJ/kg-K}$ and $C_v = 0.72 \text{ KJ/kg-K}$.

(d) State and explain Clausius Inequality.

(e) Obtain pressure volume and temperature relationship for an adiabatic process.

(f) Why Carnot cycle is not considered as an ideal cycle for a heat engine even though its efficiency is maximum under two temperature limits?

3. Attempt **any two** parts : [10×2=20]

(a) What are the main differences between two stroke and four stroke engine? With the help of neat

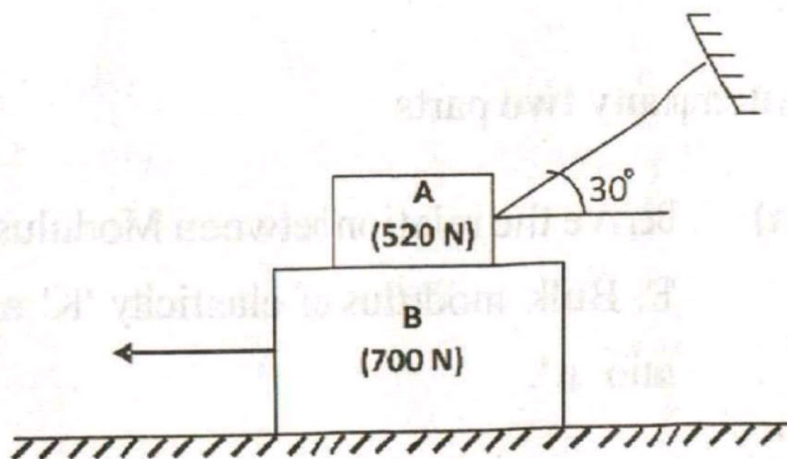
diagrams, explain the working of four stroke petrol engine.

(b) Explain the process of formation of steam at constant pressure. Also explain dryness fraction.

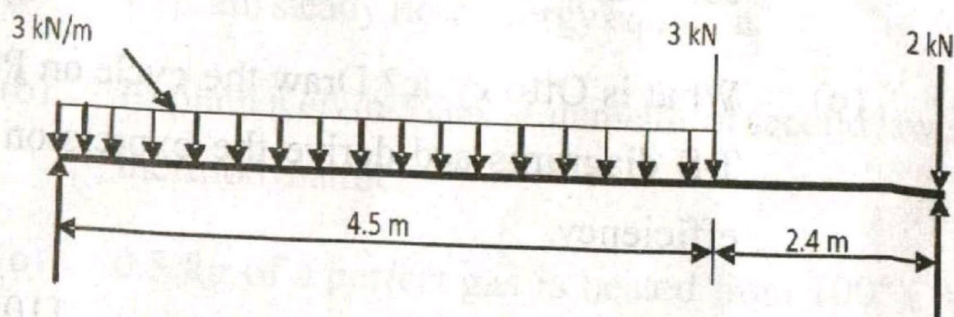
(c) What is Otto cycle? Draw the cycle on P-V and T-S diagrams and derive the expression for its efficiency.

4. Attempt **any two** parts : [10×2=20]

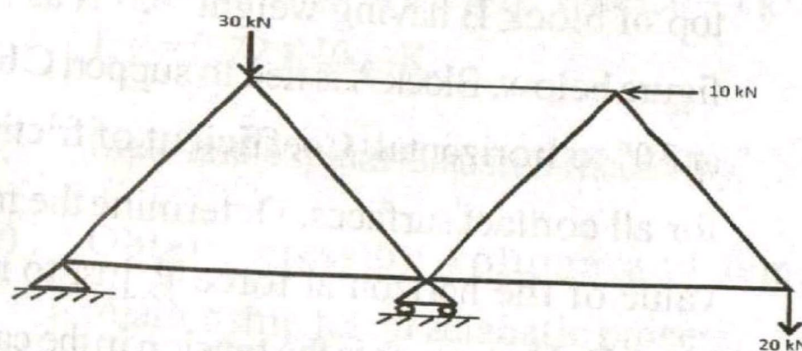
(a) Block A of weight 520 N rests on the horizontal top of block B having weight 700 N as shown in figure below. Block A is tied to support C by a cable at 30° to horizontal. Coefficient of friction is 0.4 for all contact surfaces. Determine the minimum value of the horizontal force P, just to move the block B. How much is the tension in the cable then?



- (b) Draw the shear force and bending moment diagram of the loaded beam as shown in figure below. Also calculate the maximum bending moment and the point at which it occurs:



- (c) Analyse the truss shown below. All members are 3 m long.



5. Attempt any two parts : [10×2=20]

- (a) Derive the relation between Modulus of elasticity 'E', Bulk modulus of elasticity 'K' and Poisson's ratio ' μ '.

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(4)

- (b) At a point in a strained material the stresses on two mutually perpendicular planes are 200 N/mm^2 (tensile) and 100 N/mm^2 (tensile). Determine the normal stress, shear stress and resultant stress both in magnitude and direction on a plane inclined at an angle of 30° (clockwise) to the axis of minor stress. For the given loading, can there be a plane carrying pure shear stress?
- (c) Define the term torsion? Derive torsion equation and write all the assumptions used in it.

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