Printed Pages: 03 **Sub Code: RME201**
Paper Id: 140265 **Roll No.** | | | | | | | | | | |

B.TECH
(SEM II) THEORY EXAMINATION 2018-19
ELEMENTS OF MECHANICAL ENGINEERING

Time: 3 Hours ***Total Marks: 70***

Note: 1. Attempt all Sections.

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a) Differentiate between concurrent and non- concurrent force system
b) Differentiate between overhanging beam and simply supported beam.
c) Define the term centroid, center of gravity and axis of symmetry.
d) Explain concept of pure bending, also define section modulus..
e) Define young modulus and section modulus.
f) Explain thermodynamic equilibrium.
g) Differentiate between heat pump and heat engine.

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 2

a) A wire rope is fixed at two points A and D as shown in Fig. 1. Two weights 20 kN and 30 kN are attached to it at B and C, respectively. The weights rest with portions AB and BC inclined at angles 30° and 50° respectively, to the vertical as shown in figure. Find the tension in the wire in segments AB, BC and CD and also the inclination of the segments CD to the vertical.

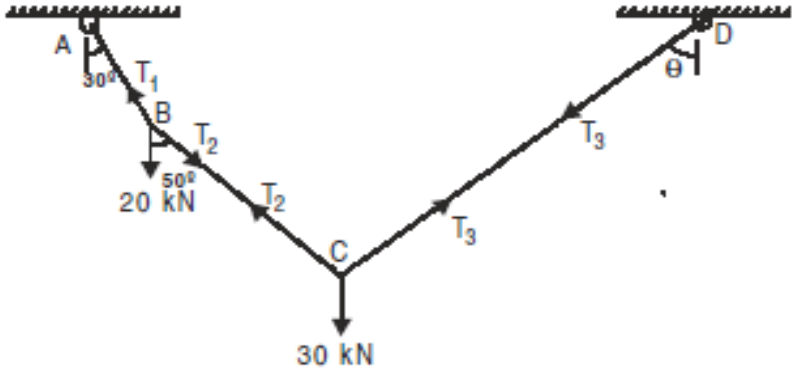

Fig 1.

b) Draw the shear force and bending moment diagram for the beam as shown in Figure2 below. Also find the point of contraflexure if any.

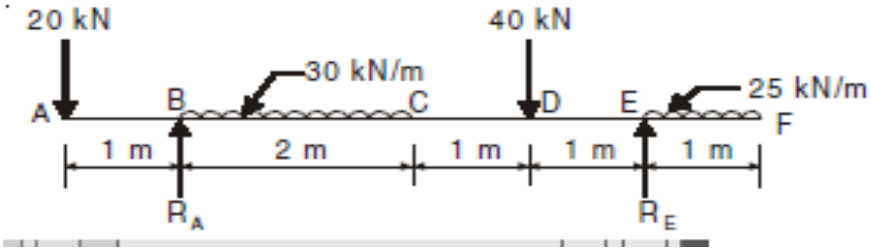

Figure 2

c) The cross-section of a prestressed concrete beam is shown in Fig. 3. Calculate the moment of inertia of this section about the centroidal axes parallel to and perpendicular to top edge. Also determine the radius of gyration..

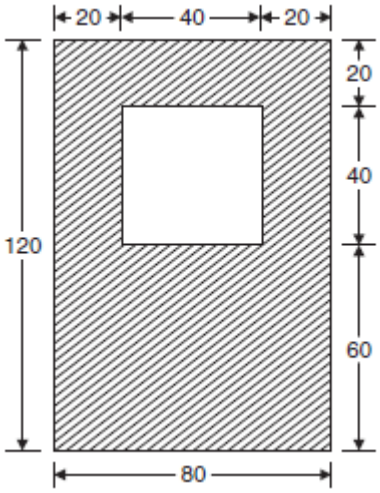

Figure 3

d) Find the extension of the bar shown in Fig.4 under an axial load of 25 kN.

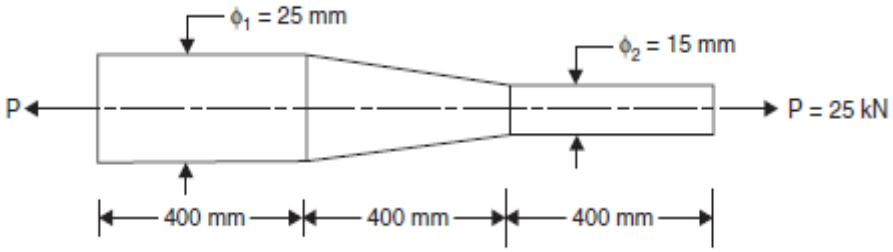

Figure 4

e) Explain otto cycle with help of p-v and T-s diagram also derive the expression for its efficiency.

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

a) Locate the centroid of a semicircle from its diametral axis using the method of integration.

b) Two cylinder of diameters 100 mm and 50 mm, weighing 200 N and 50N, respectively are placed in a trough as shown in Fig. 5. Neglecting friction, find the reactions at contact surfaces 1, 2, 3 and 4.

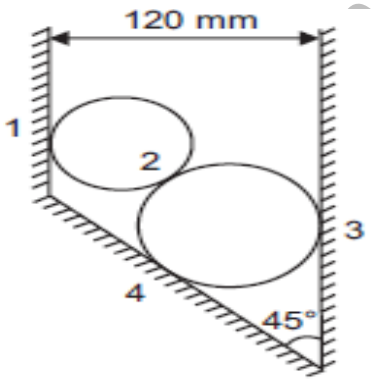

Figure 5

4. Attempt any *one* part of the following: 7 x 1 = 7

a) Find the forces in all members of the truss as shown in fig.6.

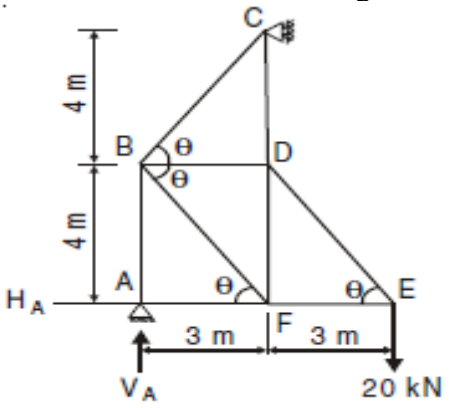

Figure-6

b) What is steel? Classify it on the basis of percentage of carbon. Write down its applications.

5. Attempt any *one* part of the following: 7 x 1 = 7

a) State the assumptions made in deriving bending equation. Also derive bending equation.

b) What is Carnot cycle? Prove the Carnot Efficiency $\eta_{carnot} = 1 - \frac{T_{min}}{T_{max}}$

6. Attempt any *one* part of the following: 7 x 1 = 7

a) What is the first law thermodynamics? Explain it with help joule's experiment. What are corollaries of the First law of thermodynamics?

b) Explain diesel cycle with help of P-V and T-S diagram and discuss all processes of cycle.

7. Attempt any *one* part of the following: 7 x 1 = 7

a) What is the Rankine Cycle? Prove the Rankine Efficiency $\eta_{Rankine} = \frac{h_1 - h_2}{h_1 - h_3}$

b) Explain the working four stroke petrol engine with neat sketch and sequence of events.