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GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (First Semester – Regular) Examinations, April – 2021

BESBS1031 – Elements of Mechanical Engineering

(Common to All Branches)

Time: 2 hrs

Maximum: 50 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions)

(1 x 10 = 10 Marks)

Q.1. Answer ALL questions

[CO#] [PO#]

- | | | |
|--|---|-----|
| a. The Lami's Theorem is applicable only for | CO1 | PO1 |
| (i) Coplanar forces | (ii) Concurrent forces | |
| (iii) Coplanar and concurrent forces | (iv) Any type of forces | |
| b. Theorem of perpendicular axis is used in obtaining the moment of inertia of a | CO1 | PO1 |
| (i) triangular lamina | (ii) square lamina | |
| (iii) circular lamina | (iv) semi circular lamina | |
| c. The centre of gravity of an equilateral triangle with each side (a) is from any of the three sides. | CO1 | PO1 |
| (i) $\frac{a\sqrt{3}}{2}$ | (ii) $\frac{a\sqrt{2}}{3}$ | |
| (iii) $\frac{a}{3\sqrt{2}}$ | (iv) $\frac{a}{2\sqrt{3}}$ | |
| d. A couple consists of | CO1 | PO1 |
| (i) two like parallel forces of same magnitude. | (ii) two like parallel forces of different magnitudes. | |
| (iii) two unlike parallel forces of same magnitude. | (iv) two unlike parallel forces of different magnitudes | |
| e. A redundant frame is also calledframe | CO2 | PO1 |
| (i) perfect | (ii) imperfect | |
| (iii) deficient | (iv) none of these | |
| f. Which of the following statements is false? | CO3 | PO1 |
| (i) Work is a state function | (ii) Temperature is a state function | |
| (iii) Change in the state is completely defined when the initial and final states are specified | (iv) Work appears at the boundary of the system | |
| g. When two bodies are in thermal equilibrium with a third body they are also in thermal equilibrium with each other. This statement is called | CO3 | PO1 |
| (i) Zeroth law of thermodynamics | (ii) First law of thermodynamics | |
| (iii) Second law of thermodynamics | (iv) Kelvin Planck's law | |
| h. The characteristic equation of gases $pV = mRT$ holds good for | CO3 | PO1 |
| (i) monoatomic gases | (ii) diatomic gas | |
| (iii) real gases | (iv) ideal gases | |
| i. The main objective(s) of Industrial robot is to | CO4 | PO1 |
| (i) To minimise the labour requirement | (ii) To increase productivity | |
| (iii) To enhance the life of production machines | (iv) All of the above | |

- j. Which of the following system has feedback system?
 (i) Open loop system (ii) Closed loop system
 (iii) Direct loop system (iv) None of the above

CO4 PO1

PART – B: (Short Answer Questions)

(2 x 5 = 10 Marks)

Q.2. Answer **ALL** questions

- Define Free body diagram
- State the laws of dry friction
- How method of joint differs from the method of section
- What is meant by thermodynamic system? How do you classify it?
- What is NC part programming?

[CO#] [PO#]

CO1 PO1

CO2 PO1

CO2 PO1

CO3 PO1

CO4 PO1

PART – C: (Long Answer Questions)

(6 x 5 = 30 Marks)

Answer **ANY FIVE** questions

Marks [CO#] [PO#]

- Two smooth spheres of weight W and radius r each are in equilibrium in a horizontal channel of A and B vertical sides as shown in Fig. 1. Find the force exerted by each sphere on the other. Calculate these values, if $r = 250$ mm, $b = 900$ mm and $W = 100$ N.

(6) CO1 PO1, PO2

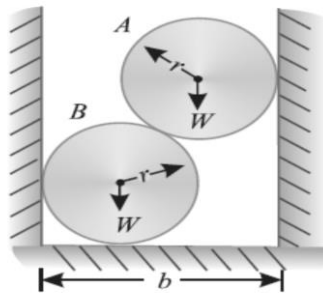


Figure 1

- With respect to coordinate axes x and y , locate the centroid of the shaded area shown in Fig.2

(6) CO1 PO1, PO2

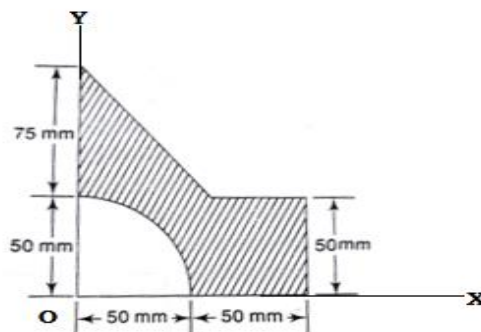
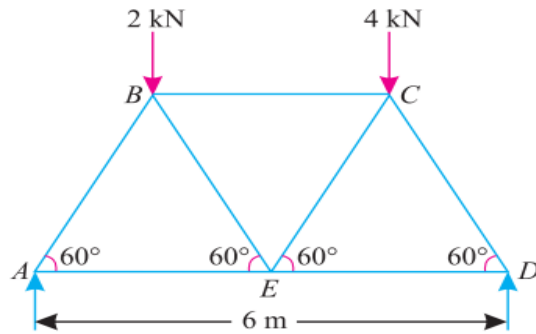


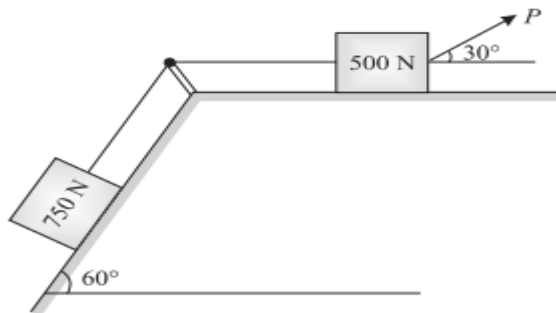
Figure 2

- Find the axial force in any four members of the truss with the loading as shown in Fig.

(6) CO2 PO1, PO2



6. What is the value of P in the system shown in Fig. 5.9(a) to cause the motion to impend? Assume the pulley is smooth and coefficient of friction between the other contact surfaces is 0.2. (6) CO2 PO1, PO2



7. Distinguish between Macroscopic & microscopic approaches (6) CO3 PO1
8. A heat engine receives heat at the rate of 1500 kJ/min and gives an output of 8.2 kW. Determine : (i) The thermal efficiency ; (ii) The rate of heat rejection (6) CO3 PO1, PO2
9. Explain the types Robotic arm configurations? (6) CO4 PO1
10. Write the difference between NC and CNC (6) CO4 PO1

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