U.S.N | | | | | | | | | | |

P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester, B.E. - Semester End Examination; May/June - 2019

Engineering Mechanics

(Common to All Branches)

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. Write a brief note on basic idealization of engineering mechanics. 6

b. With neat sketches, briefly explain different types of force systems. 6

c. Determine the magnitude and direction of the resultant for the system shown in Fig.1(c). 8

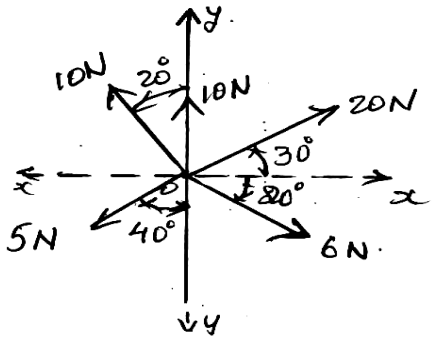


Fig.1(c)

2 a. What is support reaction? With neat sketch, explain different types of supports with their reaction details. 8

b. List and explain different types of loads that are commonly applied on beams with their reduced concentrated loads. 6

c. A beam AB is loaded as shown in Fig. 2(c), compute the reactions at the supports. 6

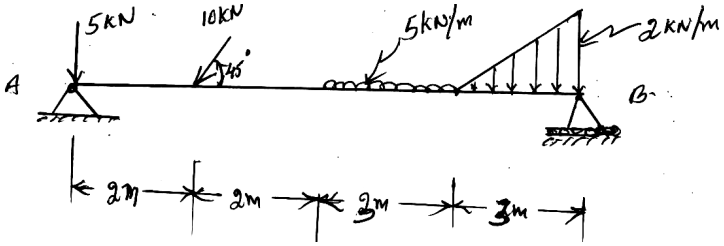


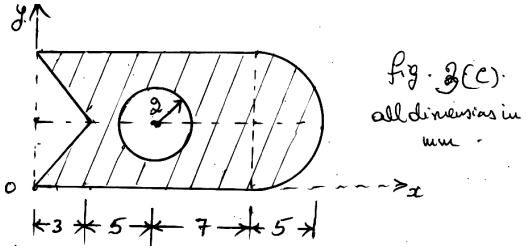
Fig. 2(c)

UNIT - II

3 a. Distinguish between Centre of gravity and Centroid. 4

b. From the first principle locate the Centroid of a rectangle of breadth "*b*" depth "*d*". 6

c. Locate the centroidal coordinates of the shaded area shown in Fig. 3(c) about *ox* and *oy*. 10

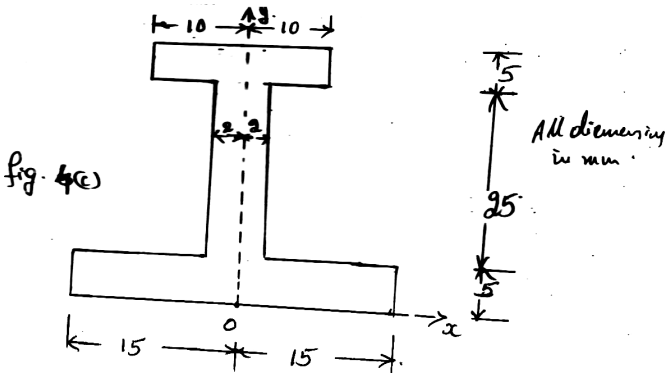


Contd…2

4 a. With the aid of sketches, explain axis of symmetry and axis of reference. 5

b. Locate the centroidal coordinate of a quarter of a circle of radius "*R*" by method of integration. 7

c. Determine the centroidal coordinates of the lamina shown in Fig.4(c) about *ox* and *oy*. 8



UNIT - III

5 a. State and prove Parallel axis theorem. 6

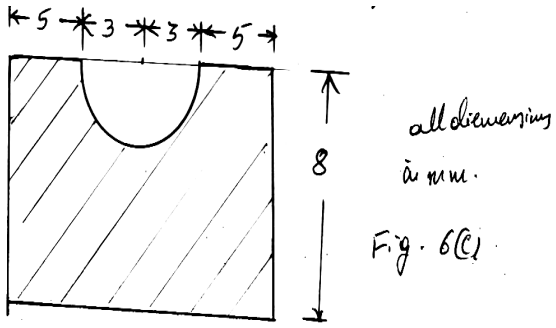
b. By the method of integration, derive an expression for M.I of a rectangle of breadth '*b*' and depth '*d*' about its base. 6

c. Determine the moment of inertia of the lamina shown in Fig. 4(c) about axis *oy*. Also find radius gyration. 8

6 a. Write a note on; i) Polar moment of inertia ii) Radius of gyration. 6

b. State and prove perpendicular axis theorem. 6

c. Determine the moment of inertia of the section shown in Fig. 6(c) about its centroidal *x*-*x* axis. 8



UNIT - IV

7 a. Write brief note on; 8

i) Limiting friction ii) Angle of repose iii) Cone of friction iv) Resultant reaction

b. A block of weight 2000 N rest on a horizontal floor and carries another block of 1500 N as shown in Fig. 7(b). What should be the value of "P" to move the block of 2000 N to the right? Take $\mu = 0.3$ for all contact surfaces. 12

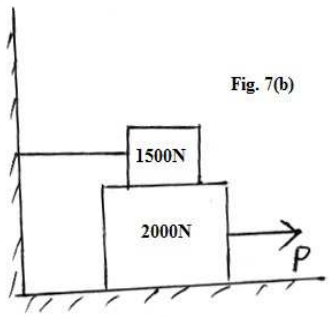


Fig. 7(b)

Contd…3

8 a. State laws of dry friction. 4

b. Show that coefficient of friction in equal to tangent of the angle of friction. 6

c. A ladder of 6 m long rests on a horizontal floor and vertical wall. The ladder weighs 250 N and carries a weight of 800 N at a distance of 4 m along the ladder at which it starts sliding. Calculate the reactions and forces at the contact points and the inclination at which it is being placed. 10

UNIT - V

9 a. With neat sketch explain; 10

i) Angle of projection ii) Time of flight

iii) Horizontatl range iv) Vertical height v) Trajectory

b. A particle is fired with a velocity of 40 m/s at an angle of 25° with horizontal, Determine; 10

i) Horizontal range

ii) Time of flight

Take; $g = 9.81$ m/s^2

10 a. Explain the terms work, power and energy. 6

b. State and explain D'Alembert's principle. 6

c. A pile hammer weighing 2500 N falls on a pile. If the hammer drops freely from a height of 5 m, find the impulsive force of the below, if the hammer comes to rest in 1/100 second. Take: $g = 9.81$ m/s^2. 8

* * * *