

BACHELOR OF TECHNOLOGY (C.B.C.S.) (2021-COURSE)
B. Tech. Sem - II Robotics & Automation Engineering : WINTER- 2022
SUBJECT : ENGINEERING MECHANICS

Day : Wednesday
 Date : 30-11-2022

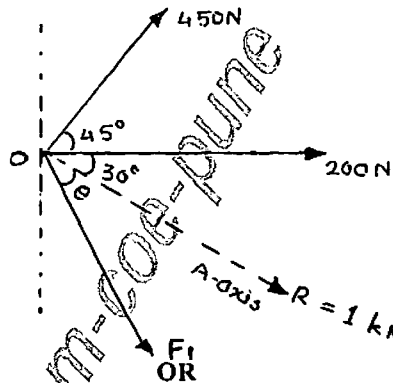
W-24127-2022

Time : 10:00 AM-01:00 PM
 Max. Marks : 60

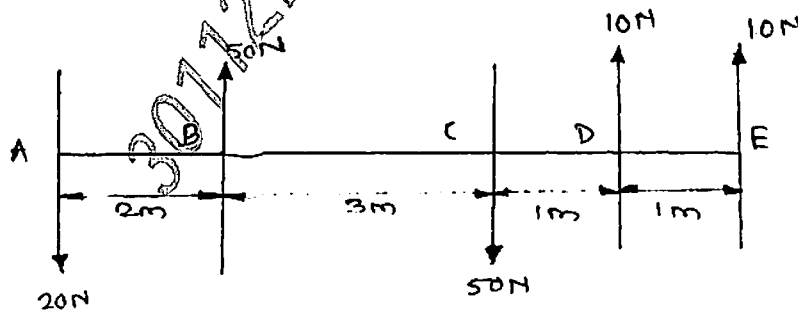
N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Assume suitable data if necessary.
- 4) Use of Non-programmable **CALCULATOR** is allowed.

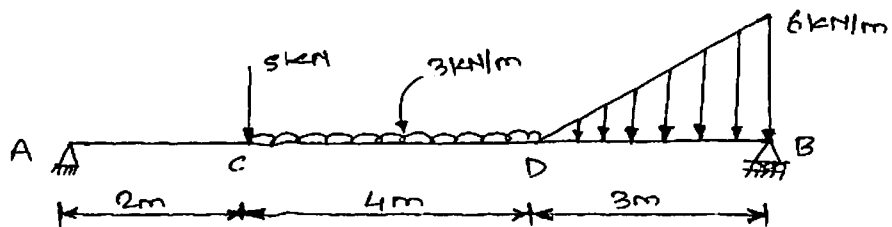
- Q.1 A) i) State - Law of Parallelogram 04
 ii) Define - Moment and Couple
- B) Three forces acts as shown in figure. Determine the magnitude and direction of F_1 so that the resultant is directed along 'A' axis has magnitude of 1kN. 06



- Q.1 A Determine the magnitude and position of resultant of given force system shown below. 04



- B Find the support reactions at A & B of the loaded beam shown in figure 06
 below.



P.T.O.

Q.2 A

Express the following terms by their formula:

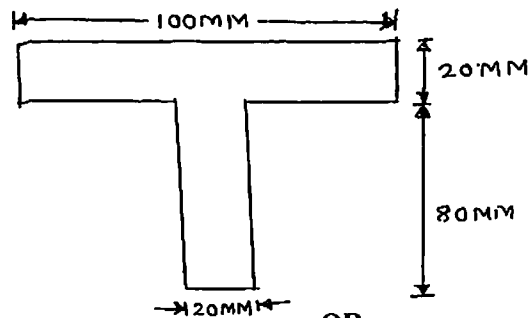
- i) Parallel Axis Theorem
- ii) Polar M.I.
- iii) Efficiency of Machine
- iv) Input & Output of Machine

04

B.

Locate the centroid of 'T' - Section shown in figure below.

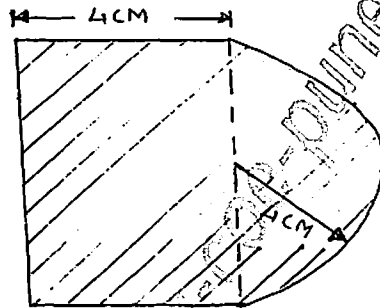
06



OR

Q.2

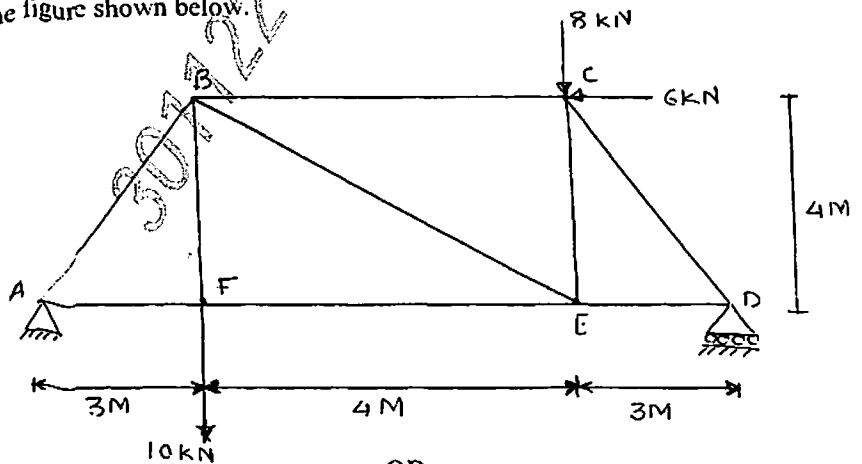
Find the Moment of Inertia of shaded area about its centroidal axis X-X and Y-Y for the given figure below.



Q.3

Calculate the forces in members of the truss AB, AF, BC, BE & FE for the figure shown below.

10

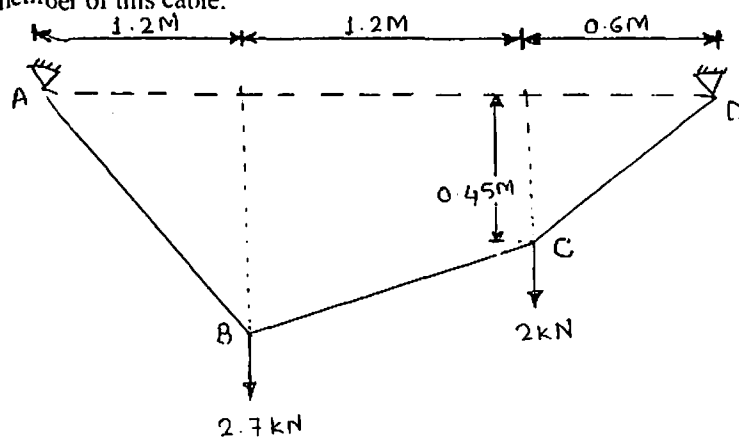


OR

Q.3

Two loads are suspended from the cable ABCD. Find the tension in each member of this cable.

10



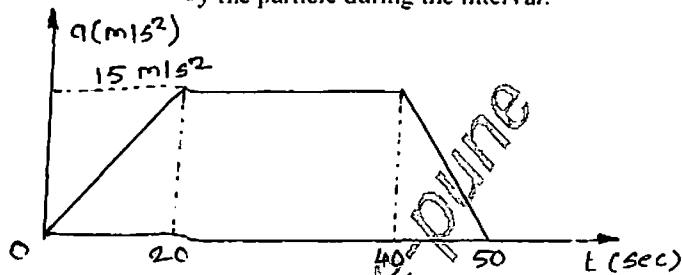
P.T.O.

Q.4 A A particle moves along the path $y = x^2 - 4x + 100$. If $V_x = 4$ m/s, find the value of velocity at $X=16$ m. 04

B A bullet fired upwards at an angle of 30° to the horizontal from point P on a hill. It strikes a target which is 80 m lower than P. the initial velocity of bullet is 100 m/s. Calculate the actual velocity with which the bullet will strike the target. 06

Q.4 A OR
A car starts from rest on a circular curve of radius 250m and accelerates at a constant tangential acceleration of 1.2 m/s². Determine the distance travelled and the time taken when magnitude of total acceleration is 1.5 m/s². 04

B Figure below shows a diagram of acceleration versus time for a particle moving along X - axis for a time interval of 0 to 50 sec. For the same time interval plot; i) the velocity time diagram and ii) the displacement time diagram : and hence find the maximum speed attained and maximum distance covered by the particle during the interval. 06

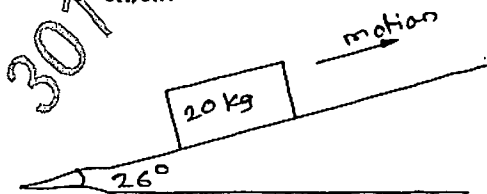


Q.5 A Explain the following ; 04

- i) Coefficient of Restitution
- ii) D'Alembert's Principle

B A mass of 20 kg is projected up an inclined of 26° with velocity of 4 m/s as shown in figure. If $\mu = 0.2$ 06

- i) Find maximum distance that the package will move along the plane and
- ii) What will be the velocity of the package when it comes back to the initial position?



OR

Q.5 Three perfectly elastic balls A,B and C masses 2kg,4kg and 8 kg move along a line with velocities 4m/s , 1m/s and 0.75 m/s respectively. 10

If the ball A strikes ball B which in turn strikes C, determine the velocities of the three balls after impact.

Q.6 A Explain the following terms in brief: 04

- i) Construction Steel
- ii) Glass & Aluminium

B Give the functions of the foundation and also explain any four types of foundations. 06

OR

Q.6 A Define 'Foundation'. Give the causes of failure of foundation. 04

B Distinguish between Load bearing structures and RCC structures. 06

* * * * *