

Code No: 153AW

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, February - 2024

ENGINEERING MECHANICS

(Electrical and Electronics Engineering)

Time: 3 Hours

Max. Marks: 75

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A**(25 Marks)**

- 1.a) What is meant by coplanar concurrent forces? [2]
- b) List out the uses of free body diagrams. [3]
- c) What is meant by wedge friction? [2]
- d) What do you understand by friction? List out the uses of friction? [3]
- e) What is the need of finding the radius of gyration? [2]
- f) Find the moment of inertia of a rectangular section 30 mm wide and 40 mm deep about X-X axis and Y-Y axis. [3]
- g) Define Motion. List out the different types of motion. [2]
- h) State work energy theorem for the system of particles. [3]
- i) State the D'Alembert's principle. [2]
- j) List out the applications of work energy principle. [3]

PART – B**(50 Marks)**

- 2.a) A triangle ABC has its side AB = 40 mm along positive x-axis and side BC = 30 mm along positive y-axis. Three forces of 40 N, 50 N and 30 N act along the sides AB, BC and CA respectively. Determine magnitude of the resultant of such a system of forces solution. The system of given forces is shown in Figure 1.

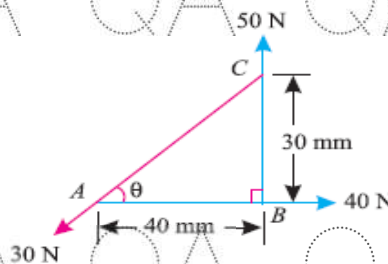


Figure 1

- b) Show that if three coplanar forces, acting at a point be in equilibrium, then, each force is proportional to the sine of the angle between the other two. [5+5]

OR

QA QA QA QA QA QA QA QA QA

OR

- 7.a) Derive the moment of inertia of a solid disc by using the basic principles.
b) Calculate the moment of inertia of a hollow circular section of external and internal diameters 100 mm and 80 mm respectively about an axis passing through its centroid. [5+5]

QA QA QA QA QA QA QA QA QA

- 8.a) A bullet moving at the rate of 300 m/s is fired into a thick target and penetrates up to 500 mm. If it is fired into a 250 mm thick target, find the velocity of emergence. Take the resistance to be uniform in both the cases.
b) A stone is thrown vertically upwards, from the ground, with a velocity 49 m/s. After 2 seconds, another stone is thrown vertically upwards from the same place. If both the stone strike the ground at the same time, find the velocity, with which the second stone was thrown upwards. [5+5]

QA QA QA QA QA QA QA QA QA

OR

- 9.a) A stone is dropped from the top of a tower 60 m high. Another stone is projected upwards at the same time from the foot of the tower, and meets the first stone at a height of 18 m. Find the velocity with which the second stone is projected upwards.
b) A projectile is fired with an initial velocity of 250m/s at a target located at a horizontal distance of 4km and vertical distance of 700 m above the gun. Determine the value of firing angle to hit the target. Neglect air resistance. [5+5]

QA QA QA QA QA QA QA QA QA

- 10.a) Define work energy principle. Also derive the equation for work energy.
b) A 20 kg block starting from rest slides up a 30° inclined plane under the action of a 175 N force directed along the inclined plane. The coefficient of kinetic friction between the block and the plane is 0.2. Determine the (i) speed of the block after it slides 4.5 m and (ii) the distance travelled by the block when its speed becomes 4.5 m/s. [5+5]

QA QA QA QA QA QA QA QA QA

OR

11. A body of mass 150 kg, rests on a rough plane inclined at 10° to the horizontal. It is pulled up the plane, from rest, by means of a light flexible rope running parallel to the plane.
The portion of the rope, beyond the pulley hangs vertically down and carries a man of 80 kg at the end. If the coefficient of friction for the plane and the body is 0.2, find
(a) the tension in the rope,
(b) the acceleration in m/s^2 , with which the body moves up the plane, and
(c) the distance in metres moved by the body in 4 seconds starting from rest. [3+3+4]

QA QA QA QA QA QA QA QA QA

---ooOoo---

QA QA QA QA QA QA QA QA QA

QA QA QA QA QA QA QA QA QA