



# MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi &amp; Affiliated to JNTUH, Hyderabad)

Accredited by NBA and NAAC with 'A' Grade &amp; Recognized Under Section 2(f) &amp; 12(B) of the UGC act, 1956

II B.Tech I Sem Regular End Examination, February-2022

## Engineering Mechanics (MECHANICAL ENGINEERING)

Max. Marks: 70

- Note: 1. Question paper consists: Part-A and Part-B.  
2. In Part - A, answer all questions which carries 20 marks.  
3. 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

(10\*2 Marks = 20 Marks)

- |       |   |    |     |     |
|-------|---|----|-----|-----|
| 1. a) | What is meant by Free body diagram? In what sense the diagram is free?    | 2M | C01 | BL1 |
| b)    | What is meant by moment of force?   | 2M | C01 | BL2 |
| c)    | Define the following<br>(i) Angle of Repose (ii) Coefficient of frictions | 2M | C02 | BL1 |
| d)    | What is limiting friction?  | 2M | C02 | BL2 |
| e)    | What are the applications of theorems of pappus?                          | 2M | C03 | BL3 |
| f)    | What is a wedge? State its purpose.                                       | 2M | C03 | BL4 |
| g)    | What do you understand by first moment of area?                           | 2M | C04 | BL2 |
| h)    | What is radius of gyration?   | 2M | C04 | BL1 |
| i)    | Write the work-energy equation in case of fixed axis rotation.            | 2M | C05 | BL5 |
| j)    | Distinguish between kinematics & kinetics.                                | 2M | C05 | BL1 |

### PART- B

(10\*5 Marks = 50 Marks)

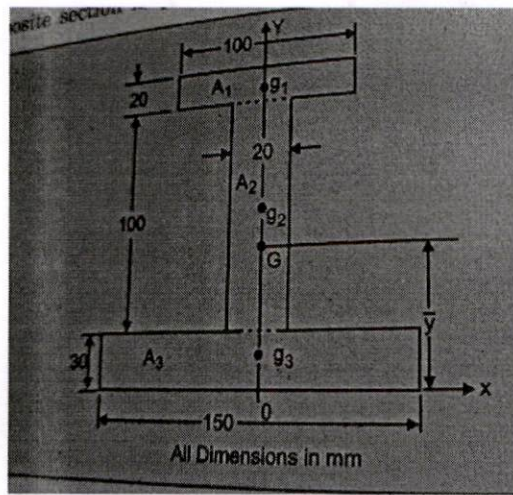
- |       |  |    |     |     |
|-------|--|----|-----|-----|
| 2. a) | Define force and explain different types of forces in detail?  | 5M | C01 | BL1 |
| b)    | Three forces 2P, 3P & 4P acts along three sides of a equilateral triangle of sides 100mm taken in order. find the magnitude and position of the resultant force. | 5M | C01 | BL5 |

OR

- |       |  |     |     |     |
|-------|--|-----|-----|-----|
| 3.    | State and prove the parallelogram law of forces.         | 10M | C01 | BL6 |
| 4. a) | Show that angle of repose is equal to angle of friction. | 5M  | C02 | BL2 |
| b)    | State the laws of friction in detail.                    | 5M  | C02 | BL5 |

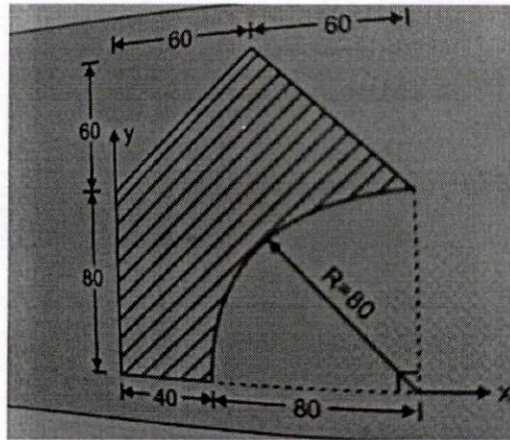
OR

- |       |   |     |     |     |
|-------|---|-----|-----|-----|
| 5.    | A pull of 250 N is inclined at 30° to the horizontal plane is required just to move a body kept on a rough horizontal plane. But the push required just to move the body is 300 N. If the push is inclined at 30° to the horizontal, find the weight of the body and the coefficient of friction. | 10M | C02 | BL4 |
| 6. a) | Locate the centroid of the I section as shown in fig,   | 5M  | C03 | BL4 |



Find the coordinates of the centroid of the shaded area with respect to the axes as shown in fig,

b)



5M C03 BL3

OR

7 State and prove pappus guldinus theorems. 10M C03 BL4

8 a) State and prove transfer formula for product of inertia. 5M C04 BL3

b) Find the moment of inertia about centroidal axis of rectangular lamina of length 60 mm and width 40 mm with central rectangular hole of length 30 mm and width 20 mm.. 5M C04 BL3

OR

9 Derive an expression to determine the moment of inertia of a semicircle about its diametric base. 10M C04 BL3

10 a) State and explain D'Alembert's principle in detail? 5M C05 BL2

A motorist travelling at a speed of 75kmph, suddenly applies brakes and halts after skidding 60 m. Determine  
b) 1) The time required to stop the car  
2) The coefficient of friction between the tyres and the road 5M C05 BL3

OR

11 Two weights 800 N and 200 N are connected by a thread and they move along a rough horizontal plane under the action of a force of 400 N applied to the 800 N weigh as shown in fig, The coefficient of friction between the sliding surfaces of the weight and the plane is 0.3. Using D'Alembert's Principle determine the acceleration of the weight and tension in the thread? 10M C05 BL6

