



R20 Regulation

Subject code: 3B4BA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech IV Semester Regular Examinations, July 2022

ENGINEERING MECHANICS (ELECTRICAL & ELECTRONICS ENGINEERING)

Maximum Marks: 70

Date:20.07.2022 Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

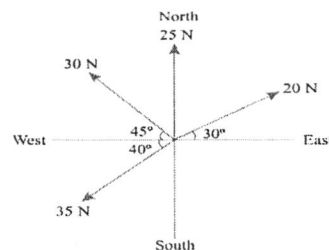
- 1 Differentiate between 'Resultant' and 'Equilibrant'.
- 2 State parallelogram law of forces.
- 3 What is centroid?
- 4 What are the two types of dynamic friction?
- 5 What is parallel axes theorem for moment of inertia?
- 6 What is mass moment of inertia?
- 7 What is work energy principle.
- 8 Define D'Alembert's principle.
- 9 Define frequency, cycle, period and free vibration
- 10 What is the application of virtual work?

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 The following forces act at a point: (i) 20 N inclined at 30° towards North of East, (ii) 25 N towards North, (iii) 30 N towards North West, and (iv) 35 N inclined at 40° towards South of West. Find the magnitude and direction of the resultant force. [10]



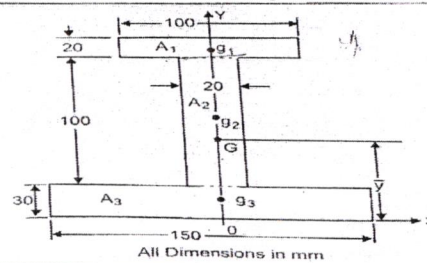
OR

- 12 ABCDE is a light string whose end A is fixed. the weights W_1 and W_2 are attached to the string at B and C and the string passes round a small smooth wheel at D carrying a weight 40 KN at the free end E. in the position of equilibrium, BC is horizontal and AB and CD makes angle 150° and 120° with horizontal. Find (i) the tension in the string AB, BC, CD and DE. (ii) Magnitude of W_1 and W_2 . [10]

- 13 A uniform ladder of weight 200N of length 4.5m rests on a horizontal ground and leans against a rough vertical wall. The coefficient of friction between the ladder and the floor is 0.4 and between ladder and vertical wall is 0.2. When a weight of 900 N is placed on the ladder at a distance of 1.2m from the top of the ladder, the ladder is at the point of sliding. Find (a) The angle made by the ladder with horizontal and (b) Reaction at the foot and top of the ladder. [10]

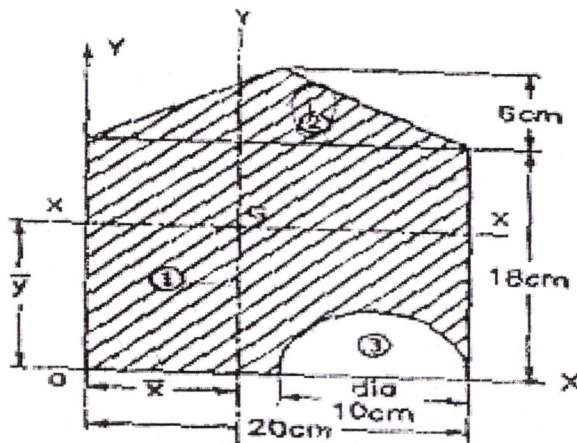
OR

- 14 Locate the centroid of the I-section as shown in figure.



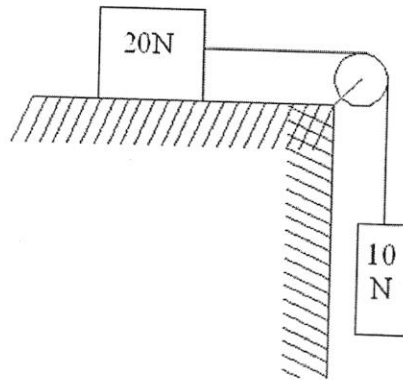
[10]

- 15 Find the moment of inertia of the section shown in the figure about its horizontal centroidal axis. [10]



OR

- 16 Derive an equation for the moment of inertia of Rectangular section about the axis passing through the CG of the section. [10]
- 17 Two bodies of weight 20N and 10N are connected to the two ends of light inextensible string, passing over a smooth pulley. The weight of 20N is placed on a horizontal surface which the weight of 10N is hanging free in air as shown in figure. The horizontal surface is a rough one, having coefficient between the weight 20N and the plane surface equal to 0.3, using Newton's second law of motion determine (i) the acceleration of the system (ii) the tension in the string. [10]



OR

- 18 A weight of 10N resting on an inclined plane that makes an angle of 30° with horizontal is connected by a string passing over a frictionless pulley at the upper end of the plane. On the free end of the string a weight of 20N is connected. If the coefficient of friction between the plane and 10N weight is 0.2, calculate the time taken by the hanging weight to descend by 1m. Adopt work-energy method. [10]
- 19 A mass of 50kg is supported by an elastic structure of total stiffness 20KN/m. The damping ratio of the system is 0.25. A simple harmonic disturbing force acts on the mass and at any time 't' seconds, the force is $75\cos 12t$ newtons. Find amplitude of the vibration and phase angle caused by the damping. [10]
- OR
- 20 State and prove equations of simple harmonic motion. [10]