**Code No.ES101CE**

**METHODIST COLLEGE OF ENGINEERING & TECHNOLOGY**

**(An Autonomous Institution)**

**B.E. (CIVIL/MECH) I-Semester Supplementary Examination, September-2023**

**Subject: ENGINEERING MECHANICS-1**

**Time: 3 hours Max.Marks:60**

**Note: Missing data, if any, maybe suitably assumed.**

**PART-A**

**Answer All the questions.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q.No.** | **Questions** | **Marks** | **CO** | **BTL** |
| **1. a** | Define the parallelogram law of forces. | **2** | **1** | **2** |
| **b** | Recall the moment of force. | **2** | **1** | **1** |
| **c** | Tell the Lami’s theorem. | **2** | **2** | **2** |
| **d** | Point A as shown in fig is in equilibrium under the action of applied forces. Find tensions T ab and Tac | **2** | **2** | **2** |
| **e** | What is cone friction | **2** | **3** | **1** |
| **f** | A Body weighing 250 N is laying on a rough horizontal plane. A horizontal effort of 50 N is required to cause the body to slide. Determine the coefficient of friction. | **2** | **3** | **1** |
| **g** | Define the term Centre of Gravity. | **2** | **4** | **2** |
| **h** | Find the y coordinate of the semi-circular lamina of radius 20mm. | **2** | **4** | **2** |
| **i** | Define Radius of gyration. | **2** | **5** | **1** |
| **j** | What are the assumptions in when frames are subjected to external load. | **2** | **5** | **2** |

**PTO**

**PART-B**

**Answer Any Five questions**.

|  |  |  |  |  |  |
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| **Q.No.** |  | **Questions** | **Marks** | **CO** | **BTL** |
| **2.** |  | A Horizontal line PQRS is 12 m long, where PQ=QR=RS=4m. Forces of 1000, 1500, 1000 and 500 N act at P,Q, R and S respectively and action of these forces make angles 900 , 600 , 450 and 300 respectively with PS. Find the magnitude, direction and position of the resultant force. | **8** | **1** | **3** |
|  |  |  |  |  |
| **3.** |  | Three identical cylinders, each weighing W, are stacked as shown in fig. on smooth inclined surfaces, each inclined at an angle ϴ with the horizontal. Determine the smallest an angle ϴ to prevent the stack from collapsing. | **8** | **2** | **3** |
|  |  |  |  |  |
| **4.** |  | Two blocks of equal weights W rests on two surfaces of same coefficient of static friction (µ=0.25). The blocks are connected by a rope passing over a frictionless pulley. Determine for what value of α, the motion of two blocks will impend. | **8** | **3** | **3** |
|  |  |  |  |  |
| **5.** |  | Find the coordinates of the centroid of the area obtained after removing a semi-circle of radius 10 cm from a quadrant of a circle of radius 20 cm as shown in fig | **8** | **4** | **4** |
|  |  |  |  |  |
| **6.** |  | Find the magnitude and nature of the forces in all members of the truss with the loading as shown in fig. | **8** | **5** | **3** |
|  |  |  |  |  |
| **7.** | **a.** | A body is subjected to the three forces as shown in fig If possible determine the direction of force F so that the resultant is in x- direction, when   1. F= 10000N ii) F=6000N | **4** | **1** | **2** |
| **b** | A ball of weight Q= 12 N rests in a right angled through, as shown in Fig. Determine the forces exerted in the sides of the through at D and E if all surfaces are perfectly smooth | **4** | **2** | **1** |
| **8.** | **a** | Define the terms Coefficient of Friction and Angle of Friction | **4** | **3** | **2** |
| **b** | State and prove the parallel axis theorem. | **4** | **4** | **3** |
| **9.** | **a** | A cube of side 400mm has a mass density of 2000kg/m3. Find out the mass moment of inertia of the cube about its centroidal axis parallel to one of its sides and one of its edges. | **4** | **4** | **3** |
| **b** | State and prove Pappus Theorem-1& 2. | **4** | **5** | **3** |

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