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| **20ME104**  **Hall Ticket Number:**   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |      |  |  |  | | --- | --- | --- | | **I/IV B.Tech(Regular/ Supplementary) DEGREE EXAMINATION** | | | | **March,2023** | **Mechanical Engineering** | | | **First Semester** | **Engineering Mechanics - I** | | | **Time: Three Hours** | | **Maximum:70 Marks** | |  |
| |  |  | | --- | --- | | ***Answer question 1 compulsory.*** | **(14X1 = 14 Marks)** | | ***Answer one question from each unit.*** | **(4X14 = 56 Marks)** | |  |

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| 1. | a) | | State Lami’s theorem. | CO1 | L1 | 1M |
|  | b) | | What is free body diagram and state its importance? | CO1 | L1 | 1M |
|  | c) | | Define resultant of a force system. | CO1 | L1 | 1M |
|  | d) | | State Varignon’s theorem. | CO1 | L1 | 1M |
|  | e) | | Distinguish moment of a force and a couple. | CO1 | L3 | 1M |
|  | f) | | What is perfect truss? How do you check the perfectness of a truss? | CO2 | L1 | 1M |
|  | g) | | State laws of dry friction. | CO2 | L1 | 1M |
|  | h) | | Define angle of friction. | CO2 | L1 | 1M |
|  | i) | | Define centroid. | CO3 | L1 | 1M |
|  | j) | | Write the expressions for centroid of composite plane figure. | CO3 | L1 | 1M |
|  | k) | | State Pappus theorem-I. | CO3 | L2 | 1M |
|  | l) | | Define polar moment of inertia. | CO4 | L1 | 1M |
|  | m) | | Define radius of gyration. | CO4 | L1 | 1M |
|  | n) | | Write the formula for the moment of inertia of a circle of radius ‘R’ about its diametric axes. | CO4 | L3 | 1M |
|  | | **Unit –I** | | | | |  |  |
| 2. | a) | | A system of four forces acting on a body is as shown in figure. Determine the magnitude and direction of resultant. | CO1 | L2 | 6M |
|  | b) | | Two identical rollers, each of weight Q = 1000 N are supported by an inclined plane and a vertical wall as shown in figure. Assuming smooth surfaces, find the reactions induced at the points of support A, B and C.  F79B7F7A | CO1 | L3 | 8M |
|  | | **(OR)** | | | | |
| 3. | Three beams hinged together at their ends are supported and loaded as shown in figure. Determine the reactions at the supports A, B, C and D, if Q = 4450 N. | | | CO1 | L4 | 14M |
| **P.T.O**  **20ME104**  **Unit –II** | | | | | | |
| 4. | A pin jointed truss is loaded and supported as shown in figure. Determine forces in all the members. | | | CO2 | L2 | 14M |
|  | | **(OR)** | | | | |
| 5. | A block of weight W1 = 1000 N rests on a horizontal surface and supports on its top another block of weight W2 = 250 N as shown in figure. The weight W2 is attached by an inclined string AB to the vertical Wall. Find the magnitude of the horizontal force P applied to the lower block to cause slipping to impend. The coefficient of friction for all contacting surfaces may be assumed to µ = 0.3.  scan0009.bmp | | | CO2 | L4 | 14M |
|  | | **Unit –III** | | | | |
| 6. | A semicircular area is removed from the trapezoid shown in figure. Determine the coordinates of the centroid for the shaded area. | | | CO3 | L3 | 14M |
|  | | **(OR)** | | | | |
| 7. | Determine the coordinates of centroid of the area bounded by the parabola y = kx2, the straight-line x = a and x-axis as shown in figure. | | | CO3 | L2 | 14M |
|  | | **Unit –IV** | | | | |
| 8. | a) | | State and prove parallel axis theorem. | CO4 | L3 | 7M |
|  | b) | | Derive the formula for moment of inertia of a triangle of base ‘b’ and height ‘h’ about its base. | CO4 | L2 | 7M |
|  | | **(OR)** | | | | |
| 9. | Find moment of inertia of the shaded area shown in the figure about the axis passing through and perpendicular to AB and having the origin at A. | | | CO4 | L3 | 14M |

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