Hall Ticket Number:

Code No. : 12017BEM O2

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD
B.E. (CBCS) II-Semester Old Examinations, May/June-2018

Basic Engineering Mechanics
(CSE, ECE & IT)

Time: **3** hours Max. Marks: **70**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. State and explain the Varignon's theorem.
2. Determine X, Y and Z component of 100N force passing from origin to a point (1,2,3)
3. Explain free body diagram with an example.
4. State Lami's theorem with a sketch.
5. Differentiate between method of joints and method of sections.
6. What are the uses of trusses?
7. State laws of friction.
8. Define cone of friction.
9. Find the centroid of a semicircular arc of radius 'R'.
10. State and prove perpendicular axis theorem.

Part-B (5 × 10 = 50 Marks)

11. a) State and explain the triangle law of forces. [2]

    b) Three forces are shown in fig (1). Determine the resultant and its position w.r.t X axis. [8]

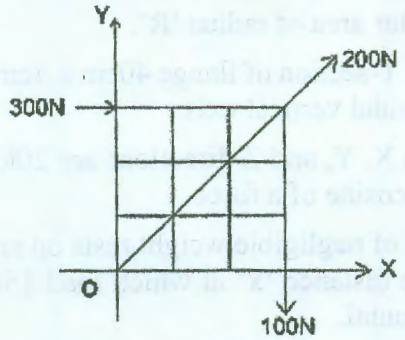

fig (1)

12. a) The 300N sphere in fig (2) is supported by the pull 'P' and a 200N weight passing over a frictionless pulley, of $\alpha=15^0$, compute the value of P and θ. [6]

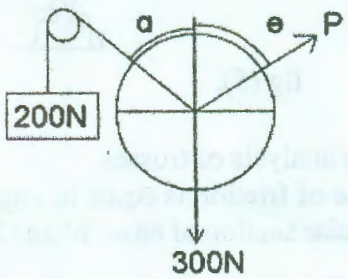

fig (2)

    b) Four concurrent forces are acting on a particle and keeping it in equilibrium. Find the fourth force if the three forces are given by $F_1=3i-4j+2k$, $F_2=6i+7j-8k$, and $F_3=-6i+3j+4k$ where i, j, k are unit vectors through the origin. [4]

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13. a) Find the magnitude and nature of force in the truss members as shown in the fig (3) using method of joints. [7]

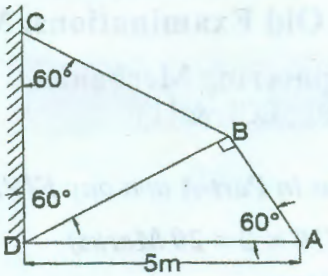

fig (3)

b) Find the magnitude and nature of force in members AB and AD for the truss shown in fig (3) by method of sections. [3]

14. a) Differentiate between static, limiting and kinetic friction by means of a sketch. [3]

b) A homogeneous cylinder of weight 300N and radius 1m rests on a horizontal surface in contact with a vertical wall as shown in fig (4). If the coefficient of friction at all contact surfaces is 0.3, determine the couple 'M' acting on the cylinder which will start anti-clockwise rotation. [7]

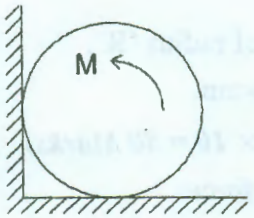

fig (4)

15. a) Find the centroid of semicircular area of radius 'R'. [5]

b) Find the moment of inertia of a T-section of flange 40cm x 4cm with centrally placed web of 2cm x 15cm about its centroidal vertical axis. [5]

16. a) If the components of a force in X, Y, and Z directions are 20kN, -30kN and 33kN. Find the magnitude and directional cosine of a force. [5]

b) A horizontal bar 12m long and of negligible weight rests on smooth inclined planes as shown in fig (5). Compute the distance 'x' at which load 150N should be place from point 'B' to keep the bar horizontal. [5]

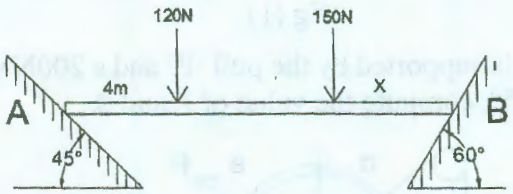

fig (5).

17. Answer any ***two*** of the following.

a) Mention the assumptions made in the analysis of trusses. [5]

b) Show that at impending motion, angle of friction is equal to angle of repose. [5]

c) Find the moment of inertia of a triangular section of base 'b' and height 'h' about its base axis. [5]