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Code No.: 21603

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
B.E. II Year I – Semester (Main) Examinations, December – 2015

Bridge Course : Engineering Mechanics

Time: 3 hours

Max. Marks: 50

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

Part-A (15 Marks)

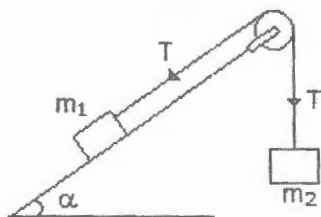
1. Find the force multiplier for a spatial force 10kN along a line from A(2, 0, 4) to B (3, 4, 2). [1]
2. For finding the moment of a force about a point only cross product is used. (True / False). [1]
3. A stone is dropped vertically down in a well of depth 30m, find the velocity of stone while hitting the water wave. [1]
4. Write the kinematic equations for plane motion. [1]
5. Show that magnitude of frictional force is depends upon normal reaction only. [1]
6. A block of weight 150 N rests on a rough horizontal surface with coefficient of friction 0.15. Determine the maximum friction force required to move the block. [2]
7. Explain cone of friction. [2]
8. How the mass moment of inertia is useful in kinetics of rotation. [2]
9. Define instantaneous centre. [2]
10. Distinguish between plane motion and curvilinear motion. [2]

Part-B (5 X 7=35 Marks)

11. a) If $\mathbf{A} = 2\mathbf{i} + 7\mathbf{j} + 4\mathbf{k}$ and $\mathbf{B} = -\mathbf{i} + 0\mathbf{j} + 3\mathbf{k}$, find the values of $\mathbf{a} \cdot \mathbf{b}$ and $\mathbf{A} \times \mathbf{B}$. [3]
b) In a spatial coordinate system, various points are referenced as given : A (8, 0, 0), B(4,-5,0), C(0,-10,0), D(0,0,-3) and E(0,3,6). A force F passes through B to E with a force multiplier of $F_m = 20$ N/m. Find the moment of F about (i) the point B and (ii) a line passing through CD. [4]
12. a) Define wedge friction. [3]
b) Determine the minimum and maximum horizontal force P required for the block which is placed on inclined ground of 45° has a weight 200kN. The angle of friction at all contact surfaces is 20° . [4]
13. a) A stone is dropped vertically down in a well of depth 30m, how much time taken to hear a water sound, if velocity of sound is 330m/s [3]
b) A stone is thrown so that it strikes the inclined ground at $s = 0$ m. If the ball rises to a maximum height of $h = 17.5$ m above the point of release, compute its initial velocity V_0 and inclination with ground. [4]

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14. a) Define the term 'Kinetics' and 'kinematics'. [3]
 b) In the system of connected bodies shown, the pulleys are of negligible weight and frictionless. Determine the mass M_1 to give M_2 (100kN) an upward acceleration of $0.4g$ [4]



15. a) Define the term pure rotation for kinetics. [3]
 b) Show that the body has plane motion means it is combination of rotation and rectilinear motion. [4]
16. a) Given the vectors $\mathbf{a} = 2\mathbf{i} - 3\mathbf{j} - 4\mathbf{k}$, $\mathbf{b} = 4\mathbf{i} + 2\mathbf{j} + \mathbf{k}$ and $\mathbf{c} = 3\mathbf{i} - \mathbf{j} - 2\mathbf{k}$, evaluate $(\mathbf{a} \times \mathbf{b}) \times (\mathbf{a} \times \mathbf{c})$. [3]
 b) A 500 N block rests on an inclined of 45° having coefficient of static friction as 0.25. Compute the value of horizontal force P necessary to move the block in the direction of applied force. [4]
17. Write short notes on any *two* of the following: [7]
 a) Projectile motion.
 b) Resultant force and inertial force with respect to dynamics.
 c) Distinguish between rotation and curvilinear motion.

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