

Code No.: 5007/N

**FACULTY OF ENGINEERING AND INFORMATICS**  
**B.E. 1 Year (New) (Common to All Branches) (Suppl.)**  
**Examination, January 2012**  
**ENGINEERING MECHANICS**

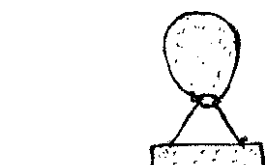
Time: 3 Hours]

[Max. Marks: 75

**Note :** Answer all questions from Part A. Answer **any five** questions from Part B.

**PART — A****(25 Marks)**

1. Two forces of equal magnitudes are acting on a particle. If the magnitude of their resultant is the same as that of the forces, find the angle between the two forces. 3
2. Define the principle of Transmissibility of forces. 2
3. Define centroid and centre of gravity. 2
4. A belt embraces an angle of  $200^\circ$  over the surface of a pulley of 500 mm dia. If the tight side tension of the belt is 2.5 kN, find out the slack side tension of the belt. The coefficient of friction between the belt and the pulley can be taken as 0.3. 3
5. Define polar moment of inertia. 2
6. Explain the transfer formula for product of inertia. 2
7. A hot air balloon having initial velocity  $V_0$  rises. A stone dropped from this balloon, when it is 140 m height, hits the ground after 10 seconds. Find the velocity of the balloon. 3



8. The motion of a particle is defined as,  $x = 15t^2 - 20$ , where 'x' is expressed in meters and is in seconds. Determine the acceleration of the particle at  $t = 4$  seconds. 3

(This paper contains 3 pages)

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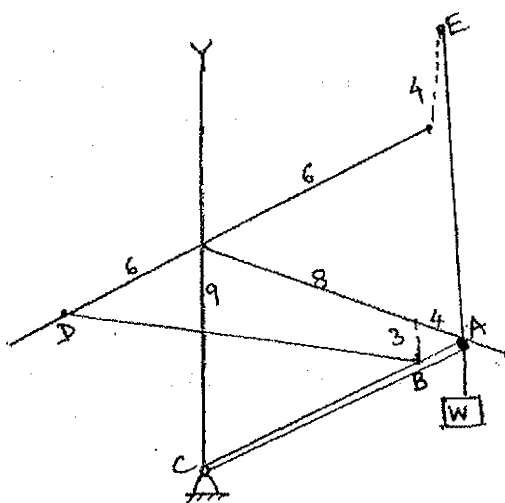
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9. State the principle of conservation of linear momentum of a particle. 2
10. A body is rotating with an angular velocity of 5 rad/sec. After 5 seconds the angular velocity of the body becomes 14 rad/sec. Determine the angular acceleration of the body. 3

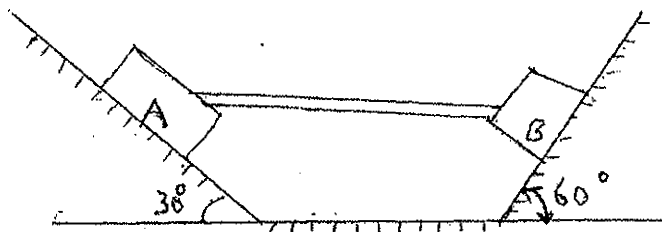
**PART — B**

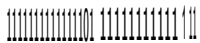
**(5x10=50 Marks)**

11. In the system shown in fig., determine the length of the common perpendicular between lines AE and BD. 10



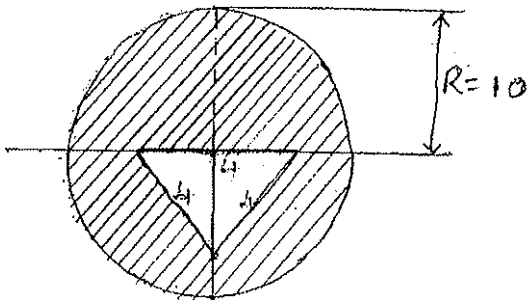
12. Locate the centroid of frustum of a cone of height 8 cm and having the diameter of 5 cm and 8 cm at top and bottom of the frustum of cone respectively. 10
13. Two blocks A and B each weighing 1500 N are connected by a uniform horizontal bar which weighs 100 N. If the angle of limiting friction under each block is  $15^\circ$ , find the force P directed parallel to the  $60^\circ$  inclined plane, that will cause motion impending to the right. 10





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14. Find the moment of inertia of the section shown in Fig., about horizontal and vertical centroidal axes. All dimensions are in cm. 10



15. The driver of an automobile decreases the speed at a constant rate from 70 to 50 Km/hr, over a distance of 200 m, along a curve of 500 m radius. Determine the magnitude of the total acceleration of the automobile, after the automobile has travelled 100 m along the curves. 10

16. a) A pile of negligible mass driven by a hammer of mass 200 kN. If the pile is driven 50 cm into the ground, when the hammer falls from a height of 3 m, find the average force of resistance of the ground. 8

b) Define "co-efficient of restitution". 2

17. a) What is an elastic impact and write their types. 2

- b) A plate shown below, moves in xy plane as below :  
 x component velocity of point A = 450 mm/sec.  
 x component velocity of point B = — 200 mm/sec.  
 y component velocity of point C = 700 mm/sec.  
 Determine angular velocity of the plate. 8

