Code No. 6392

FACULTY OF ENGINEERING

B.E. (Bridge Course) II – Semester (Supplementary) Examination, December 2013

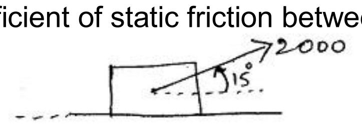
Subject: Engineering Mechanics

Time: 3 Hours **Max.Marks: 75**

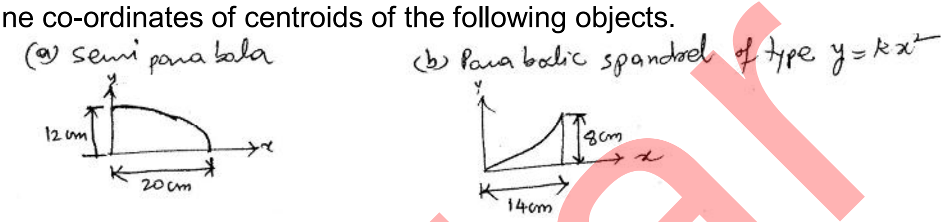
Note: Answer all questions from Part A. Answer any five questions from Part B.

PART – A (25 Marks)

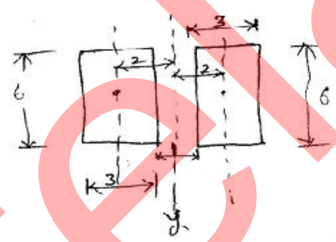
1. Find the angle between the forces, if two forces of equal magnitude of their resultant is the same as that of the forces. (2)
2. Define Lami's theorem with figure. (2)
3. A block shown below is just moved by a force of 200 N. The weight of the block is 1000 N. Determine the coefficient of static friction between the block and the floor. (2)



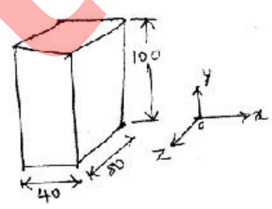
4. Determine co-ordinates of centroids of the following objects. (3)



5. Determine moment of inertia of the following blocks about centroidal y-axis.
   Note: All dimensions are in cm. (3)



6. Determine mass moment of inertia of the following rectangular prism about centroidal axis parallel to z-axis. Take mass of the rectangular prism = 2.9 kg.
   Note: All dimensions are in mm. (3)



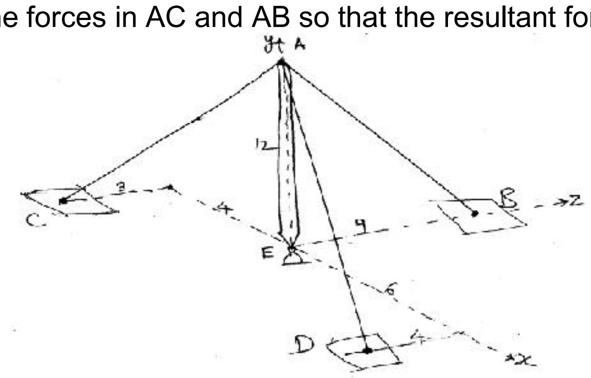
7. Car P moves along straight road at 20 m/s and is followed by car Q moving at 22 m/s. When the distance between them is 20 m, car Q decelerates at 0.2 m/s^2. Is it possible for car Q to catch car P. (3)
8. If a thin hoop of mass 'm' and radius 'r' rolls down an incline from a height 'h' without slipping, the maximum attainable velocity 'v' of its mass centre will be the

   a) $v = \sqrt{gh}$ b) $v = \sqrt{\frac{4}{3}gh}$ c) $v = \sqrt{\frac{2}{3}gh}$ d) $v = \sqrt{2gh}$ (2)

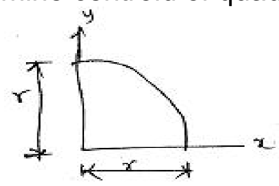
9. The displacement of a particle is defined by x=4 cos 2t. Find the position at t = 2.5 seconds. Calculate amplitude and frequency of the particle. (2)
10. A train of the weight 5050 kN is pulled up by an engine on a level track at a constant speed of 52 km/hr. The resistance due to friction is 16 N per kN of weight of train. Calculate the power of the engine. (3)

PART – B (50 Marks)

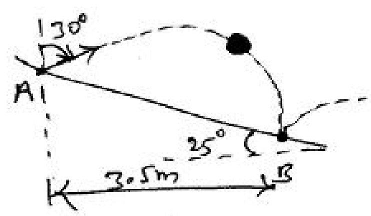
11. A vertical boom AE is supported by guy wires from A to B, C and D. If the tensile load in AD = 260 N, find the forces in AC and AB so that the resultant force on A will be vertical. (10)



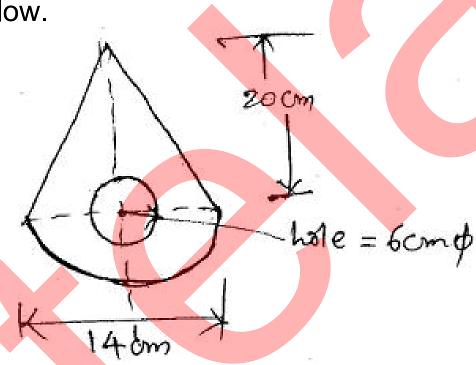
12. Derive an expression to determine centroid of quadrant, from first principles. (10)



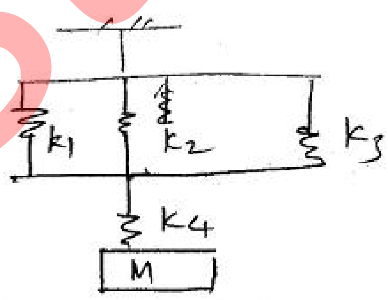
13. A ball is dropped vertically on to a 25° inclined plane at A. The direction of rebound forms an angle of 30° with vertical. Knowing that the ball strikes the inclined plane at 'B', determine.
    a) The velocity of rebound at A
    b) The time required for the ball to travel from A to B.



14. Find the moment of inertia of the section about horizontal and vertical axis through the centroid as shown below. (10)

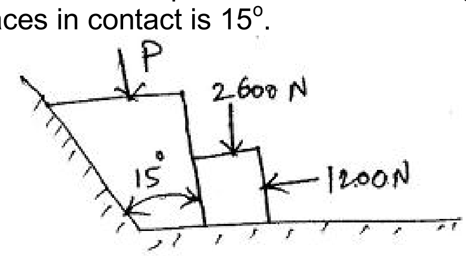


15.(a) Determine the equivalent spring stiffness for the system shown below. (5)



(b) A simple screw jack having mean diameter 10 cm and pitch of the threads is 1 cm. If the coefficient of friction between the screw and nut is 0.15 and length of handle of screw jack is 54 cm. Determine the effort required and the efficiency of the crew jack if (a) A load of 3000 kN is lifted and (b) the same load is to be lowered. (5)

16. Determine the value of force P required to start the wedge shown below. The angle of friction for all the surfaces in contact is 15°. (10)



17. The frequency of free vibrations of a weight W with a spring constant 'k' is 14 cycles/second. When an extra weight of 25 N is coupled with the weight W, the frequency reduces to 11 cycles/second. Find the weight W and stiffness 'k' of the spring. (10)

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