Subject Code: R13110/R13 **Set No - 1**

I B.Tech I Semester Regular/Supple. Examinations Nov./Dec. – 2015

ENGINEERING MECHANICS

(Common to CE, ME, CSE, PCE, IT, Chem. E, Aero E, AME, Min E, PE, Metal E, Textile Engg.)

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

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

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PART-A

1. (a) Distinguish between rigid body, deformable body and fluid.
   (b) What is Lami's theorem?
   (c) Derive centroid of a right angled triangle.
   (d) Find the area moment of inertia of a circle.
   (e) Define D'Alembert's principle.
   (f) Define translation and write the equations of translation.

[4+3+4+4+4+3]

PART-B

2. (a) A body weighing 60kN rests in equilibrium on a rough plane whose slope is 30^0.The plane is raised to a slope of 45^0 .What is the force applied to the body parallel to the plane that will support the body on the plane?
   (b) What are the laws to add two forces and several concurrent, coplanar forces? Explain in detail.

[8+8]

3. (a) Three bars, hinged at A and D and pinned at B and C as shown in Fig.1 below form a four-linked mechanism. Determine the value of P that will prevent movement of bars

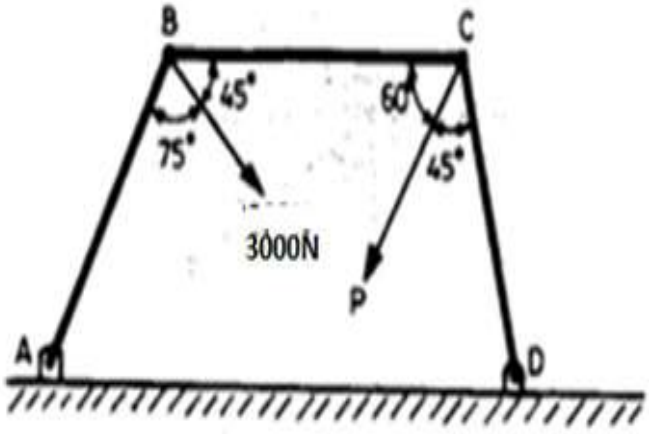

Fig.1

   (b) Define space diagram and free body diagram. Explain with examples.

[10+6]

Subject Code: R13110/R13 **Set No - 1**

4. Find the centroid of the following composite figure.2 given below

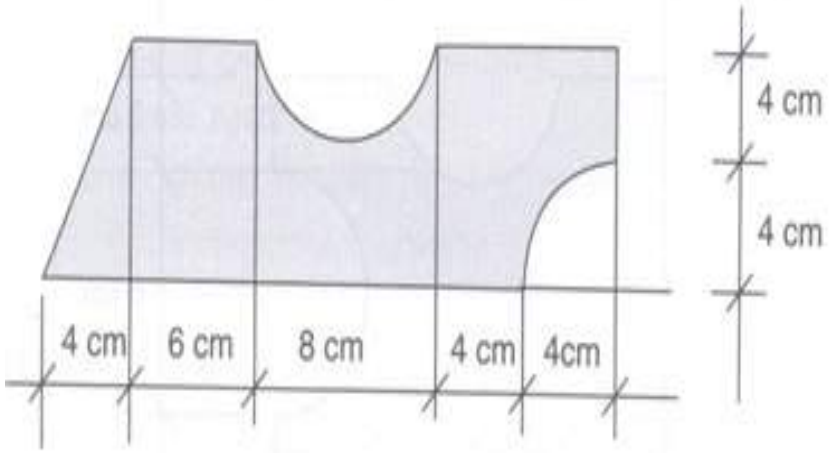

Fig.2

[16]

5. (a) State and prove the transfer theorem of mass moment of inertia.
   (b) What is moment of inertia? Distinguish between area moment of inertia, polar moment of inertia and mass moment of inertia.

[10+6]

6. (a) What are different types of motion of rigid body?
   (b) An object falls from rest from an unknown height. In the last second of its motion the object travels a distance of 50m.If g = 9.8 m/s^2 determine
   (i) height from which the object falls and (ii) total time taken by the object in falling.

[8+8]

7. (a) What do you understand by potential energy and kinetic energy of a body?
   (b) Derive impulse momentum equation.

[8+8]

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Subject Code: R13110/R13 **Set No - 2**

I B.Tech I Semester Regular/Supple. Examinations Nov./Dec. – 2015

ENGINEERING MECHANICS

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

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

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PART-A

1. (a) Define moment of couple.
   (b) What is Varignon's theorem?
   (c) Derive centroid of a quarter circle.
   (d) Find the area moment of inertia of a triangle.
   (e) Differentiate between curvilinear motion and rectilinear motion.
   (f) Define work and energy.

[3+4+4+4+4+3]

PART-B

2. (a) A body weighing 70kN rests in equilibrium on a rough plane whose slope is 30^0.The plane is raised to a slope of 45^0. What is the force applied to the body parallel to the plane that will support the body on the plane?
   (b) State and prove triangular law of forces.

[10+6]

3. Find the forces in the strings PS, PQ and PR. (as shown in fig.1)

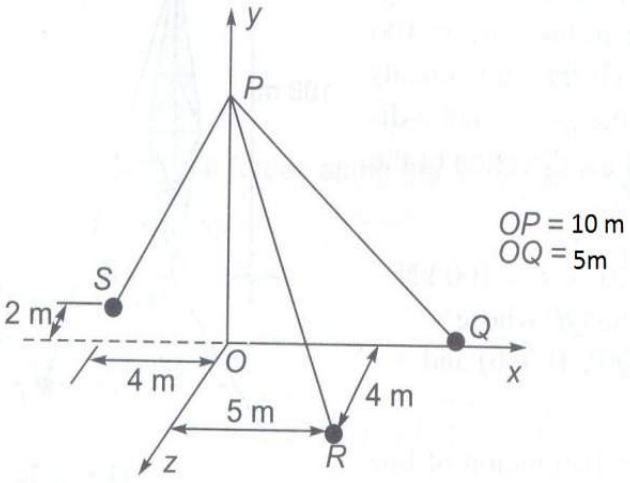

Fig.1

[16]

4. Find the centroid of the following
   a) Triangle
   b) Semi circle
   c) T- section
   d) Spandrel

[16]

Subject Code: R13110/R13 **Set No - 2**

5. (a) State and prove the parallel axis theorem.
   (b) What is mass moment of inertia of a right circular cone?

[6+10]

6. (a) What are different types of motion of rigid body?
   (b) An object falls from rest from an unknown height. In the last second of its motion the object travels a distance of 60m. If g = 9.8 m/s^2 determine
   (i) height from which the object falls and (ii) total time taken by the object in falling.

[6+10]

7. (a) Derive work energy equation.
   (b) What is fixed axis rotation of motion and plane motion?

[9+7]

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Subject Code: R13110/R13 **Set No - 3**

I B.Tech I Semester Regular/Supple. Examinations Nov./Dec. – 2015

ENGINEERING MECHANICS

(Common to CE, ME, CSE, PCE, IT, Chem. E, Aero E, AME, Min E, PE, Metal E, Textile Engg.)

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

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

*****

PART-A

1. (a) What is limiting friction and impending motion?
   (b) Derive converse law of triangle of forces.
   (c) Find the centre of gravity of parallelogram.
   (d) Find the area moment of inertia of a quarter circle of radius R.
   (e) Write about fixed axis rotation.
   (f) State D'Alembert principle.

[3+5+4+4+3+3]

PART –B

2. (a) Two identical rollers, each of weight 90N are supported by an inclined plane and a vertical wall as shown in the fig.1. Determine the reactions at the points of supports A,B and C assuming all the surfaces to be smooth. Also find the reaction forces between the spheres.

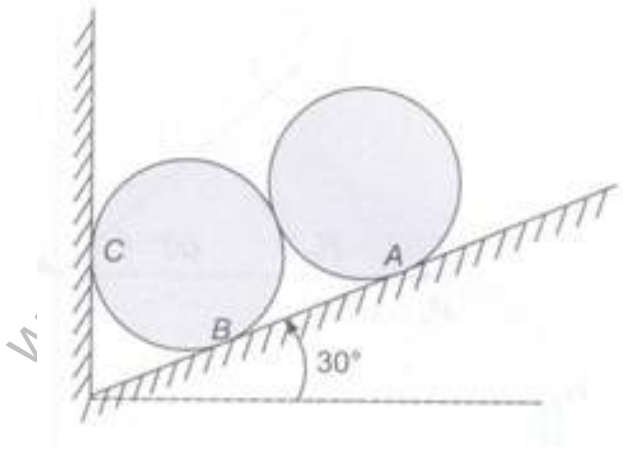

Fig.1

(b) Define cone of friction and coefficient of friction.

[10+6]

Subject Code: R13110/R13 **Set No - 3**

3. Three bars, hinged at A and D and pinned at B and C as shown in Fig.2 below form a four-linked mechanism. Determine the value of P that will prevent movement of bars.

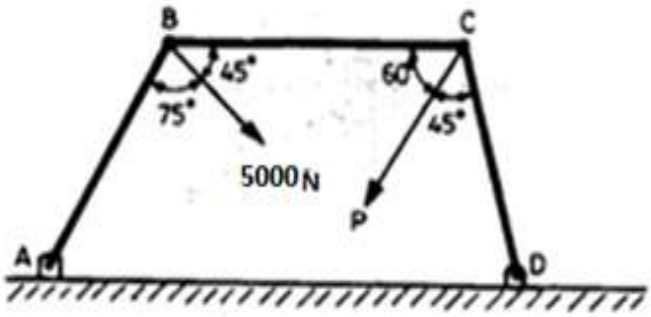

Fig.2

[16]

4. (a) State and prove Pappus Theorems I and II.
   (b) Derive the formula of C.G from first principles.

[8+8]

5. (a) Find the area moment of inertia for an area shown in the fig.3

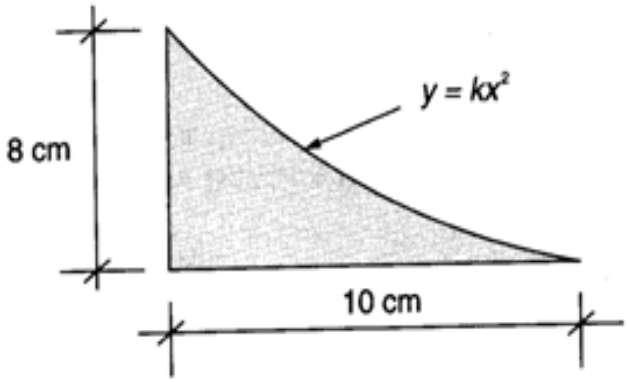

Fig.3

   (b) Find the mass moment of inertia of a thin rod of length L about its centroidal axes

[8+8]

6. (a) Distinguish between translation motion and rotational motion.
   (b) Explain the law of conservation of energy.

[8+8]

7. (a) Explain the terms momentum of a body and angular momentum of a body.
   (b) Explain the work energy principle.

[8+8]

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Subject Code: R13110/R13 **Set No - 4**

I B.Tech I Semester Regular/Supple. Examinations Nov./Dec. – 2015

ENGINEERING MECHANICS

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

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

*****

PART-A

1. (a) State Coulomb's laws of friction.
   (b) State the principle of transmissibility of force.
   (c) Derive the centre of gravity of a semi circle.
   (d) Find mass moment of inertia of a solid sphere.
   (e) Define uniform velocity and uniform acceleration.
   (f) Define coefficient of restitution.

[3+4+4+4+4+3]

PART –B

2. A block weighing 5000N is to be raised by means of a 12^0 wedge as shown in fig.1. Assume $\mu = 0.3$ for all the surfaces of contact. What is the horizontal force P that should be applied to raise the block? Weight of the wedge is 150N.

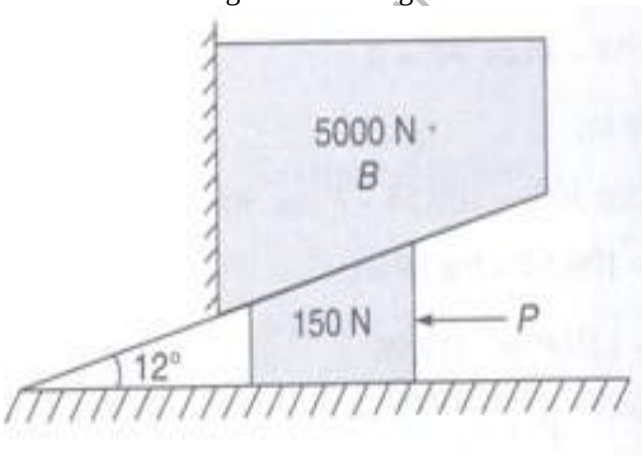

Fig.1

[16]

3. (a) Discuss the graphical method of finding resultant of coplanar forces.
   (b) State and prove Lami's theorem.

[8+8]

Subject Code: R13110/R13 **Set No - 4**

4. Locate the centroid for the shaded area as shown in the fig.2 below.

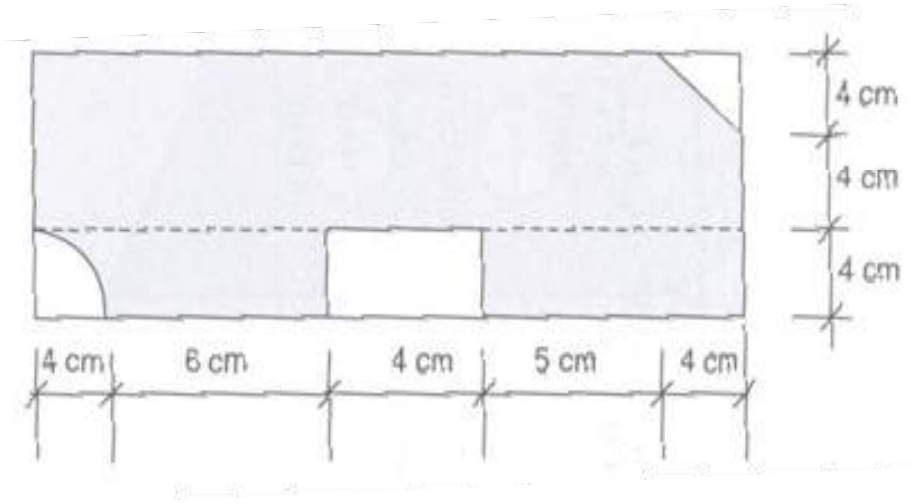

Fig.2

[16]

5. (a) State and prove Perpendicular Axis theorem.
   (b) Find the mass moment of inertia about the centroidal axes for a right circular cone.

[6+10]

6. (a) What is the analysis of a rigid body in translation?
   (b) State and prove D'Alembert's principle.

[8+8]

7. (a) Derive impulse momentum equation.
   (b) Prove K.E = ½ mv^2

[8+8]

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