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

I B. Tech I Semester Supplementary Examinations Aug. – 2015

ENGINEERING MECHANICS

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

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 the theorem used for the equilibrium of a particle applied with the three coplanar, concurrent forces? State and prove.

(b) Why static coefficient of friction is always greater than kinetic coefficient of friction?

(c) What is the moment of inertia of a triangular lamina about its horizontal centroidal axis?

(d) What is the centroid of a rectangle, circle and triangle about the both axes?

(e) The velocity of a particle is given by $V = 4t^3 - 5t^2$, when does the acceleration of the particle become zero?

(f) Write the equations of translation.

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

PART –B

2.(a) Prove that the angle of friction is equal to the angle of the inclined plane, when a solid body of weight W placed on the inclined plane is about to slide down.

(b) State and prove the converse law of polygon of forces.

[8+8]

3. Find the force in the string PS, PQ and PR shown in fig.1

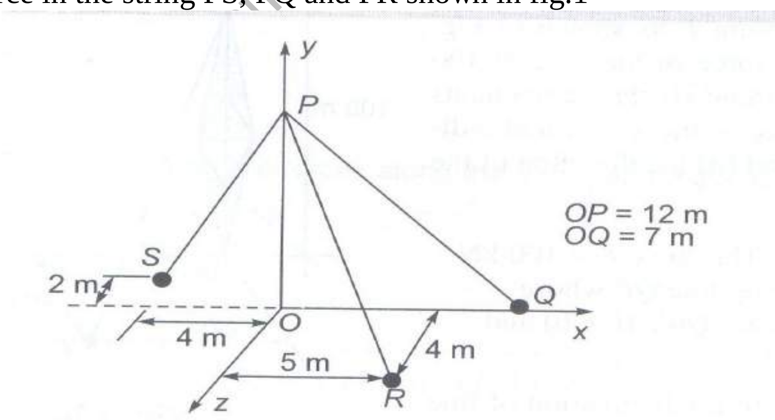


Fig.1

[16]

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

4.(a) Locate the centroid of the figure.2 shown below

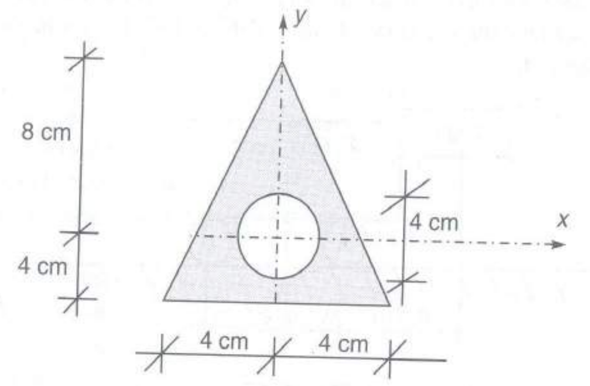


Fig.2

(b) Derive the centre of gravity of a flat plate.

[8+8]

5.(a) Derive the mass moment of inertia of a thin disc.

(b) State and prove parallel axis theorem.

[8+8]

6.(a) Derive the expression for maximum height for projectile motion.

(b) A stone is dropped from the top of a tower. When it has fallen a distance of 10m, another stone is dropped from a point 38m below the top of the tower. If both the stones reach the ground at the same time, calculate the height of the tower and the velocity of the stones when they reach the ground.

[8+8]

7.(a) Two particles of masses 10kg and 20kg are moving along a straight line towards each other at velocities of 4m/s and 1m/s respectively. If e= 0.6, determine the velocities of the particles immediately after collision. Also find the loss of kinetic energy.

(b) Explain the principle of conservation of energy.

[10+6]

*****

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

I B. Tech I Semester Supplementary Examinations Aug. – 2015

ENGINEERING MECHANICS

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

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) Find the resultant of the forces shown in the fig.1 and the angle it makes with x-axis.

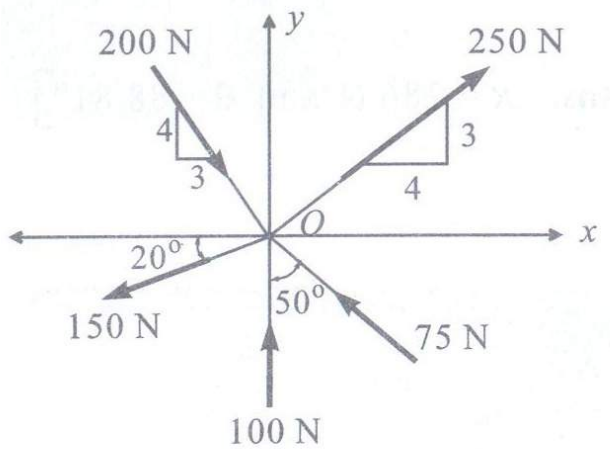


Fig.1

(b) Define the Varignon's theorem.

(c) Define centroid and centre of gravity.

(d) Find the area moment of inertia of a quarter circle of radius R.

(e) Derive the equation $S = ut + \frac{1}{2}at^2$

(f) What are the different types of rigid body motions? [4+4+4+5+3+2]

PART –B

2.(a) Two identical rollers, each of weight 200N are supported by an inclined plane and a vertical wall as shown in the fig.2. 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.

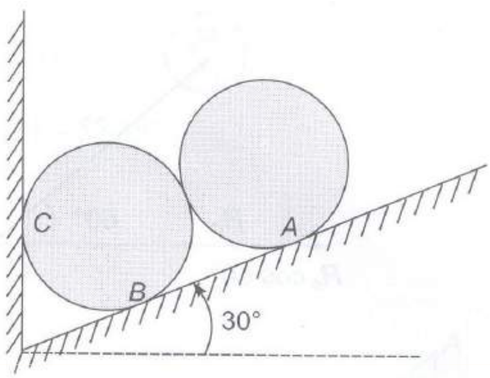


Fig: 2

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

2.(b) Define Angle of repose and angle of friction.

[10+6]

3. Find the force in the string shown in the fig.3 below

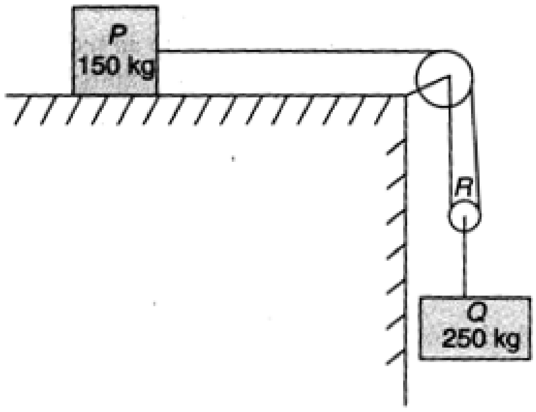


Fig-3

[16]

4.(a) Locate the centroid for the shaded area as shown in the fig.4.

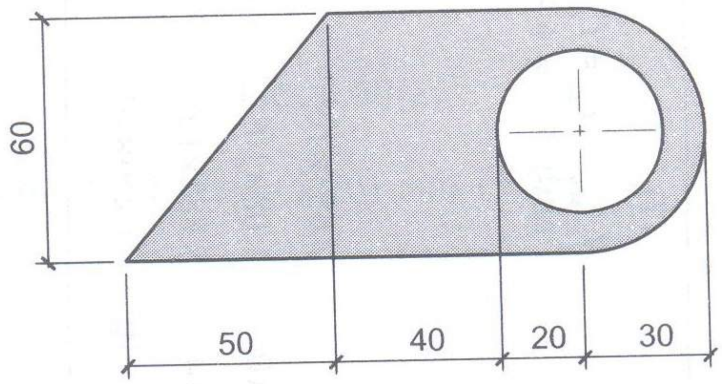


Fig.4 (All Dimensions are in mm)

(b) State and prove Pappus theorems I and II.

[8+8]

5.(a) Calculate the product moment of inertia for an area shown in the fig5.

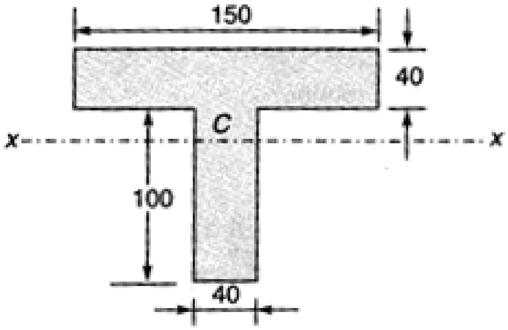


Fig.5

Subject Code: R13110/R13

Set No - 2

5.(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) A stone is dropped from the top of a tower .When it has fallen a distance of 8m, another stone is dropped from a point 32m below the top of the tower. If both the stones reach the ground at the same time, calculate the height of the tower and the velocity of the stones when they reach the ground.

[8+8]

7.(a) Two particles of masses 12kg and 24kg are moving along a straight line towards each other at velocities of 5m/s and 2m/s respectively. If e = 0.6, determine the velocities of the particles immediately after collision. Also find the loss of kinetic energy.

(b) Explain the work energy principle.

[10+6]

*****

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

I B. Tech I Semester Supplementary Examinations Aug. – 2015

ENGINEERING MECHANICS

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

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 laws of friction.
(b) State the principle of transmissibility of force.
(c) Derive the centre of gravity of a 'I' section of web 10mm x 100mm and flanges 10mm x100mm.
(d) Find moment of inertia of a rectangular section.
(e) Derive the equation $v^2 - u^2 = 2as$
(f) Define coefficient of restitution.

[2+4+5+4+4+3]

PART –B

2.(a) A force P = 911N is directed from point A (3, 2, 3) metres towards a point B (-4, 5,-1) meters. Determine the force vector P.
(b) Explain and define the term Free Body Diagram. Draw the free body diagram of a ball of weight W, supported by a string AB and resting against a smooth vertical wall at C and also resting against a smooth horizontal floor at D

[8+8]

3. Three cylinders each weighing 130 N and 20cm in diameter are placed in a channel of which is rectangular in section as shown in fig.1.
(i) Determine the pressure exerted by the cylinder A on B at the point of contact.
(ii) What are the pressures exerted by the two bottom cylinders at the base of the channel and walls at the point of contact.

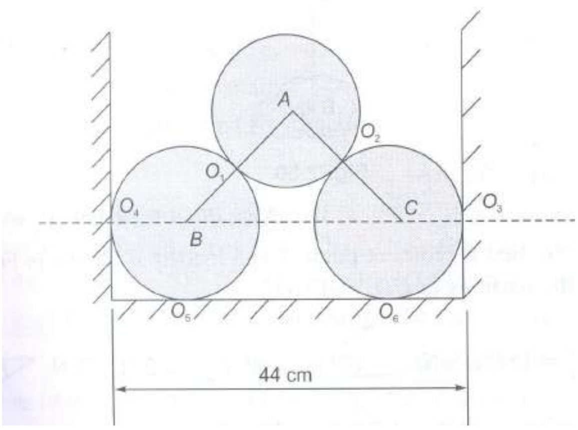


Fig.1

[16]

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

4. Locate the centroid for the shaded area shown in the fig.3.

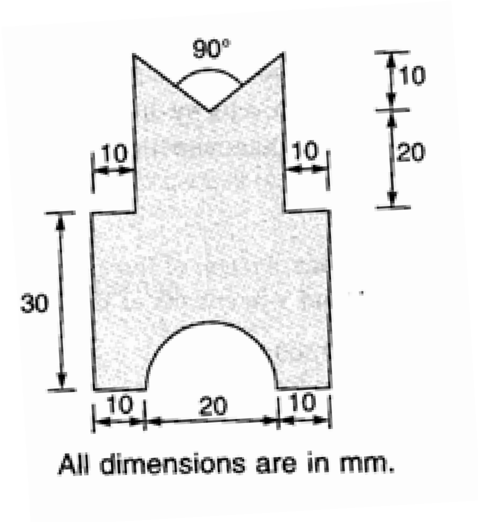


Fig-2

[16]

5.(a) State and prove Parallel Axis theorem.

(b) Find the mass moment of inertia about the centroidal axes for a right circular cone.

[8+8]

6.(a) A car travelling at a speed of v= 60 kmph is braked and comes to rest in 8sec after the brakes are applied. Find the minimum coefficient of friction between the wheels and the road.

(b) State and prove D'Alemberts principle.

[8+8]

7. A bullet of mass 81gm and moving with a velocity 300m/s is fired into a block of wood and it penetrates to a depth of 12cm. If the bullet moving with the same velocity were fired into a similar piece of wood 6cm thick, with what velocity would it emerge? Also, find the force of resistance, assuming it to be uniform.

[16]

*****

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

I B. Tech I Semester Supplementary Examinations Aug. – 2015

ENGINEERING MECHANICS

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

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**
*****

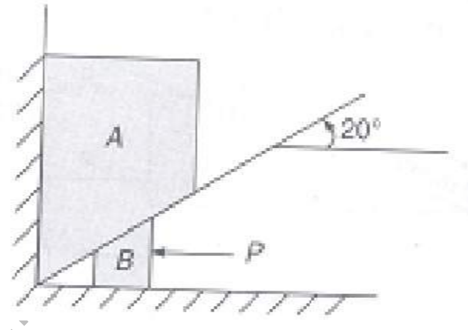
PART-A

1.(a) Define wedge and wedge friction.
(b) State triangular law of forces. What is the use of this law?
(c) Define couple.
(d) Using Pappus theorem find the volume of a sphere of radius r.
(e) Distinguish between rectilinear motion and curvilinear motion.
(f) Derive the equation for the work done by a Torque.

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

PART –B

2. Determine the horizontal force P required for wedge B to raise block A of weight 4000N as shown in fig.1. The coefficient of friction on all surfaces is equal to 0.3.



[16]

Fig-1

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

3. Two identical rollers, each weighing 80 N are supported by an inclined plane and a vertical wall as shown in fig.2. 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.

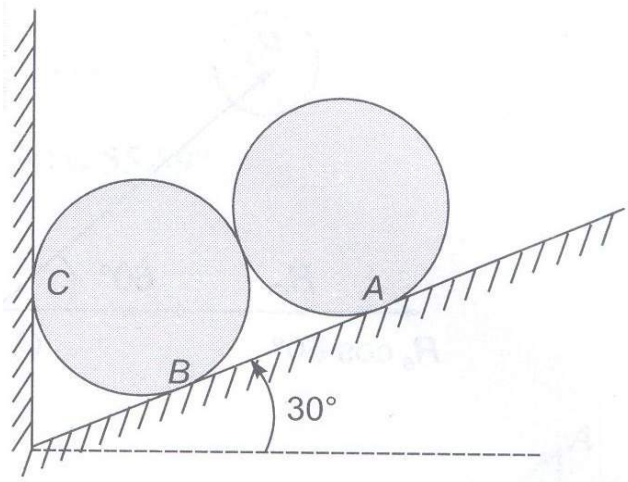


Fig2.

[16]

4.(a) Find C.G of the composite fig.3 given below

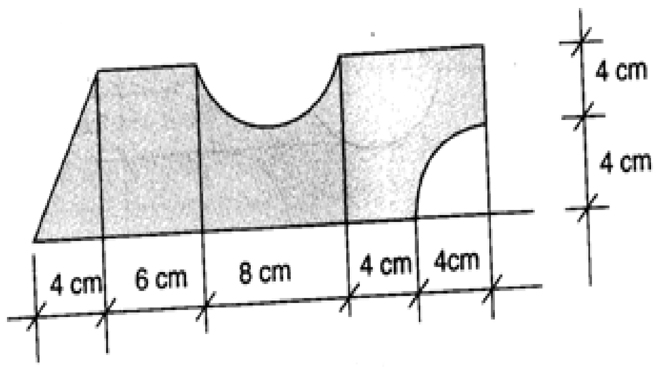


Fig.3

(b) State and prove Parallel Axis theorem.

[8+8]

5. Determine the mass moment of inertia of a right circular cone shown in the fig.4

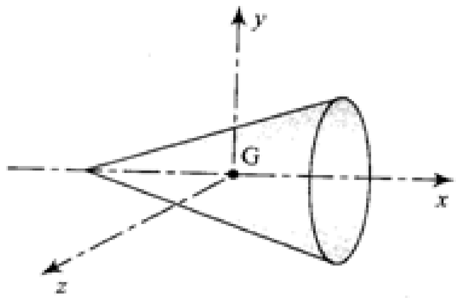


Fig.4

[16]

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

6.(a) A homogeneous sphere of weight 120N rolls along a 30^0 incline without slipping. The radius of the sphere is 100mm. Determine the acceleration of the sphere.

(b) State and prove D'Alembert's principle.

[8+8]

7. Write about the following

(a) Coplanar concurrent forces

(b) Angular velocity and Angular acceleration

(c) Conservation of angular momentum

(d) Conservation of principle energy.

[4+4+4+4]

*****