Subject Code: R13210/R13 **Set No - 1**

I B. Tech II Semester Supplementary Examinations Feb. - 2015

ENGINEERING MECHANICS

(Common to ECE, EEE, EIE, Bio-Tech, E Com.E, Agri. 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**

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PART-A

1.(i) Find the resultant of a system of concurrent, coplanar forces shown in the fig1.

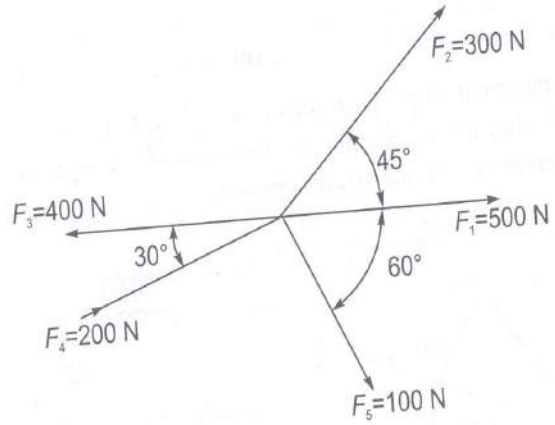

Fig:1

(ii) Define a Free Body Diagram. Give two examples.
(iii) State Pappus theorems I and II.
(iv) Find the area moment of inertia for an area shown in the fig.2

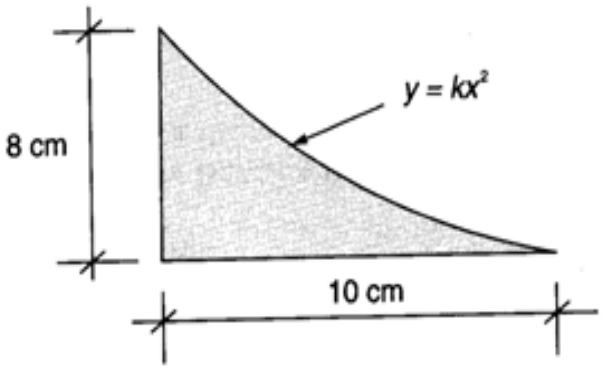

Fig.2

(v) Derive the equation v = u+at
(vi) Write the equations of translation.

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

|''|''|||''|'''|||'|

PART –B

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

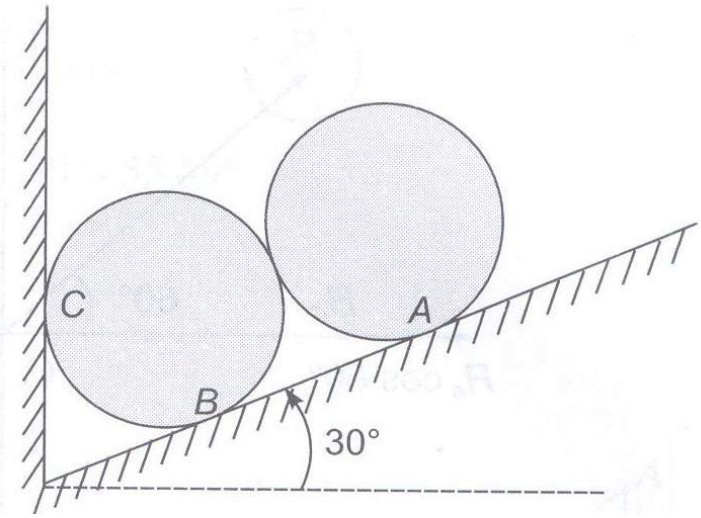

Fig:3

(b) State and explain Parallelogram law of forces.

[10+6]

3. Three cylinders each weighing 100 N and 18cm in diameter are placed in a channel of which is rectangular in section as shown in fig.4.
(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.

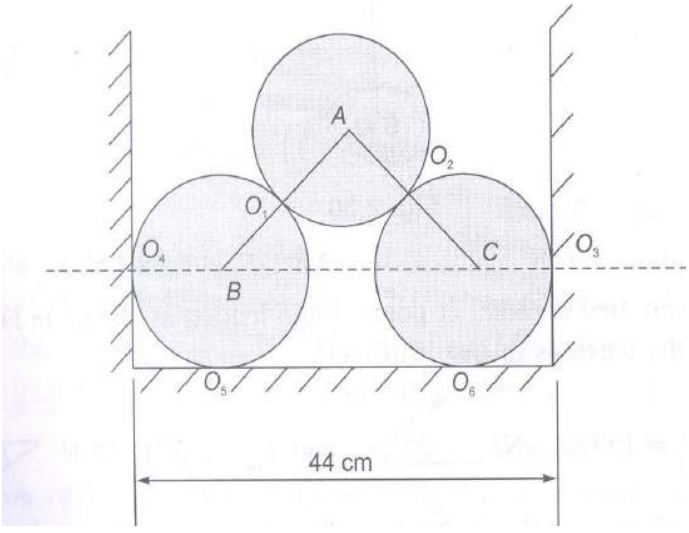

Fig.4

[16]

4.(a) Locate the centroid for the shaded area shown in the fig.5.

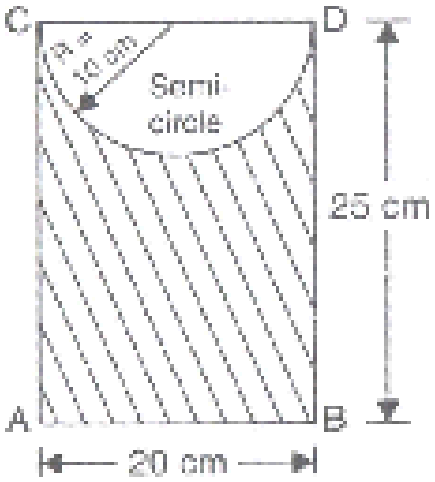

Fig.5

(b) Determine the centroid of the triangle (b x h) about the base from basic principles.

[10+6]

5. Derive the mass moment of inertia of a solid cylinder of radius R and height h about the centroidal axes.

[16]

6.(a) Derive work energy equation for translation?

(b) Explain the law of conservation of energy.

[8+8]

7.(a) Prove that the tension in the cable supporting a lift, when lift is moving up is given by T= W [1+a/g]

(b) Explain the terms momentum of a body and angular momentum of a body.

[10+6]

Subject Code: R13210/R13 **Set No - 2**

I B. Tech II Semester Supplementary Examinations Feb. - 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.(i) Find the reaction force on a particle shown in the fig1.

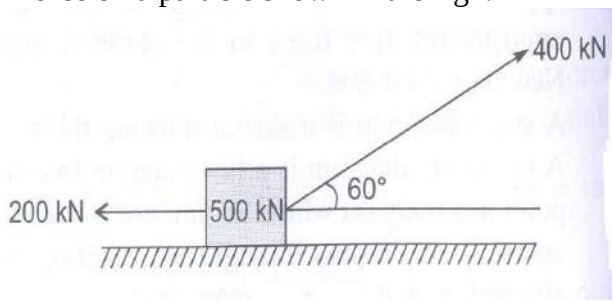

Fig: 1

(ii) Define centriod and centre of gravity, with examples.
(iii) State and prove Lami's theorem.
(iv) Find the area moment of inertia of a semicircle of radius R about its diametrical axis
(v) Derive the equation $S= ut + \frac{1}{2} at^2$
(vi) Write the equations of K.E and P.E.

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

PART –B

2.(a) Two identical rollers, each of weight 100N 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.

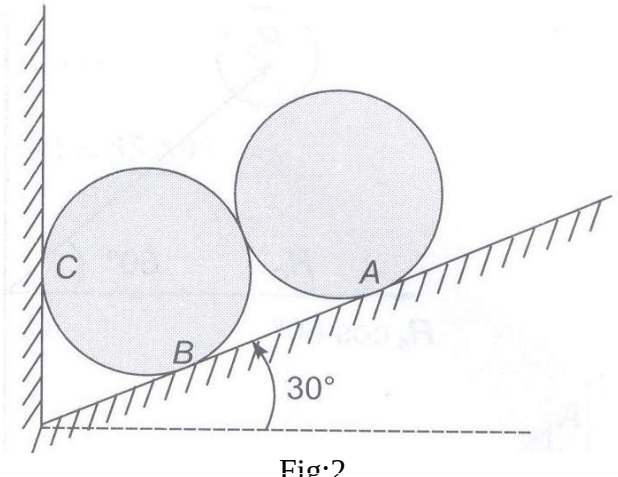

Fig:2

|''|''|||''|'''|||'|

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

[10+6]

3. Three cylinders each weighing 80 N and 16cm in diameter are placed in a channel of which is rectangular in section as shown in fig.3.
(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.

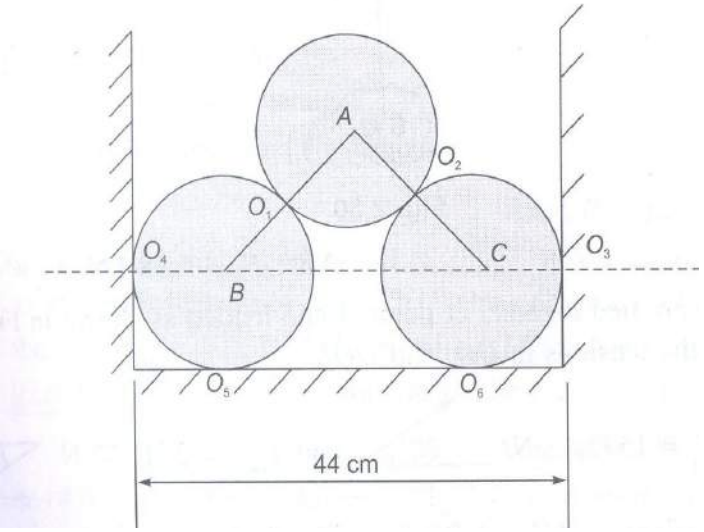

Fig.3

[16]

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

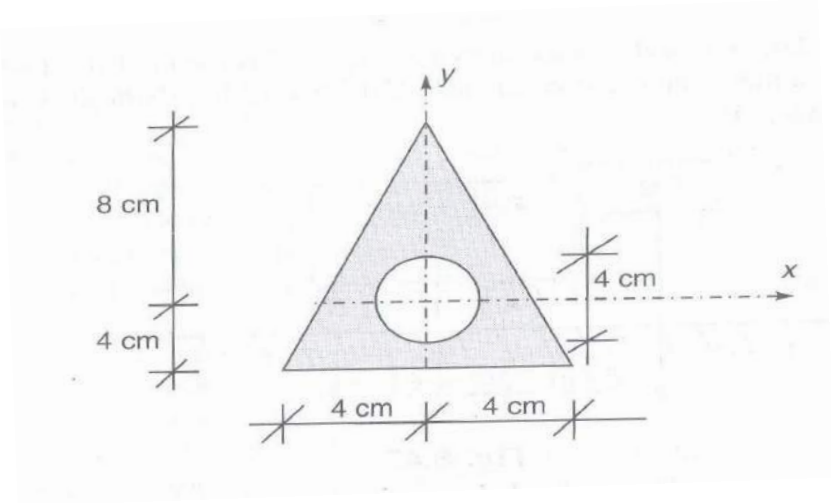

Fig.4

(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 fig.5.

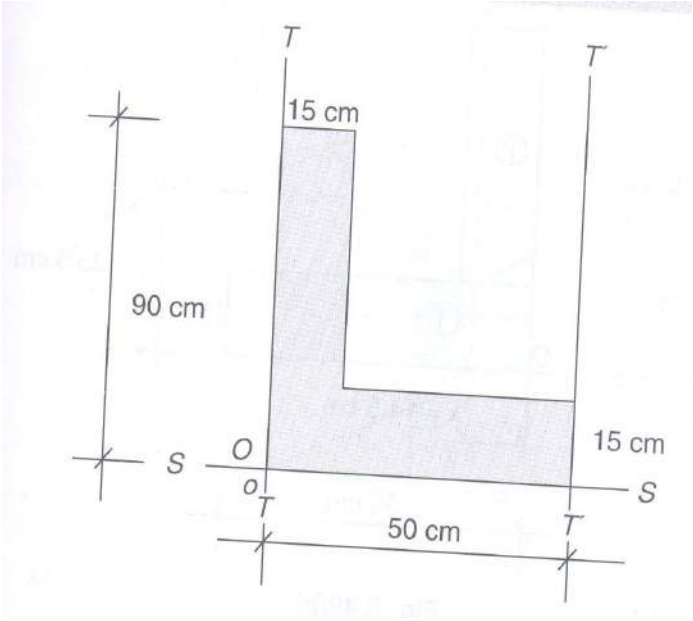

Fig.5

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

[8+8]

6. For the system of connected bodies shown in fig.6, determine the velocity and distance moved by each block 8sec after release from rest and the tension in the string. Blocks A and B are 150N and 200N respectively. The coefficient of friction between block A and the contact surface is 0.26.

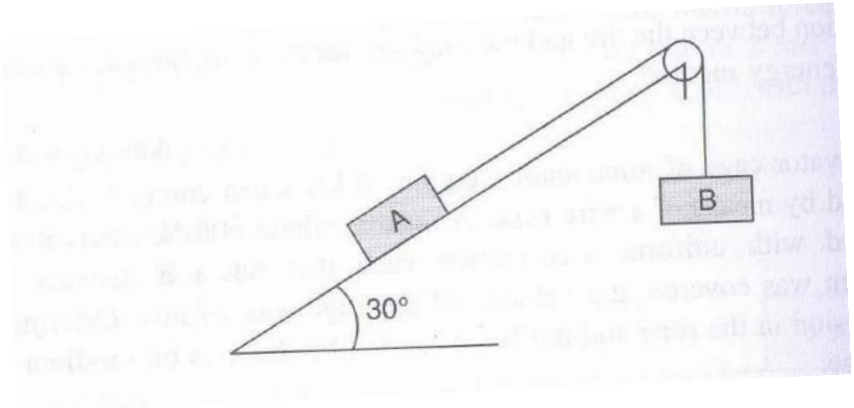

Fig.6

[16]

7.(a) Derive work energy equation for translation?

(b) Explain the principle of conservation of energy.

[8+8]

|''|''|||''|'''|||'|

Subject Code: R13210/R13 **Set No - 3**

I B. Tech II Semester Supplementary Examinations Feb. - 2015

ENGINEERING MECHANICS

(Common to ECE, EEE, EIE, Bio-Tech, E Com.E, Agri. 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.(i) State laws of friction.
(ii) Write the equations of equilibrium
(iii) Derive the centre of gravity of a 'T' section of web 10mm x 100mm and flange 10mmx100mm.
(iv) Find moment of inertia of a hollow circular section.
(v) Derive the equation $v^2 - u^2 = 2as$
(vi) Derive the equation for the work done by a Torque.

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

PART –B

2. A block weighing 5000N is to be raised by means of a 12^0 wedge as shown in fig.1. Assume μ =0.4 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.

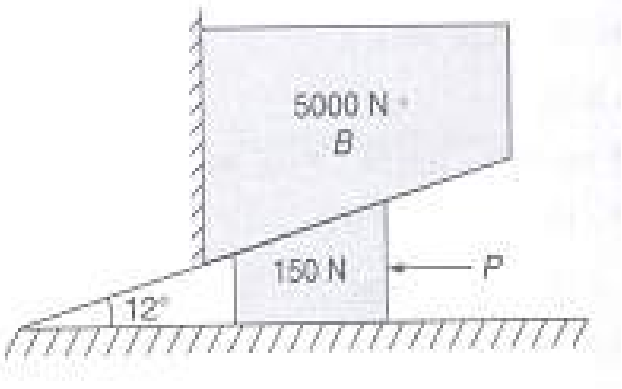

Fig.1

[16]

3. Three cylinders each weighing 120 N and 18cm in diameter are placed in a channel of which is rectangular in section as shown in fig.2.
   (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.

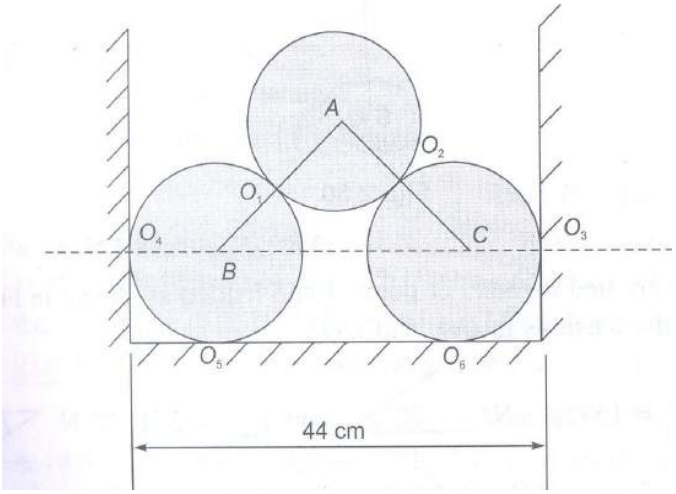

Fig.2

[16]

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

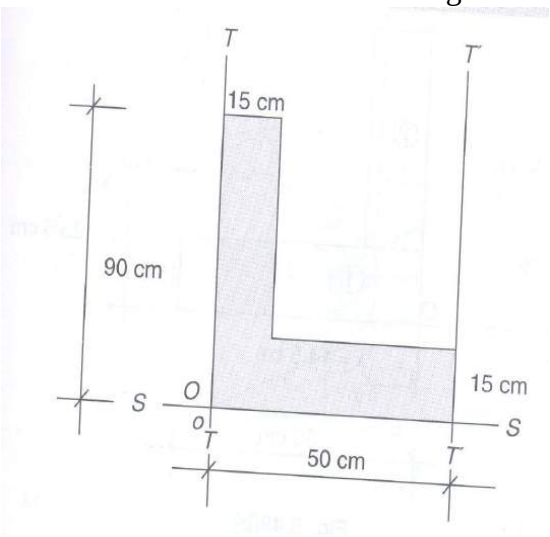

Fig.3

(b) State and prove Parallel Axis theorem.

[8+8]

5. Find the area moment of inertia about the centroidal axes for the shaded area shown in the fig.4.

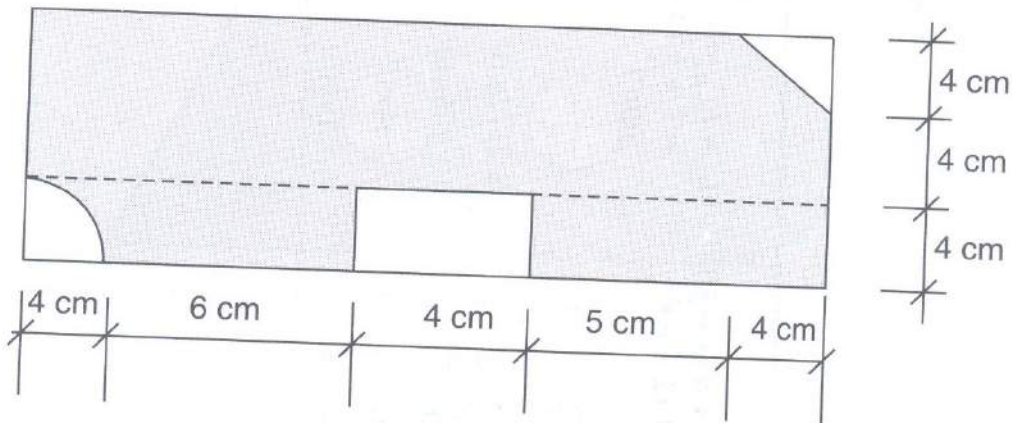

Fig.4

[16]

6. For the system of connected bodies shown in fig.5, determine the velocity and distance moved by each block 10 sec after release from rest and the tension in the string. Blocks A and B are 100N and 200N respectively. The coefficient of friction between block A and the contact surface is 0.26.

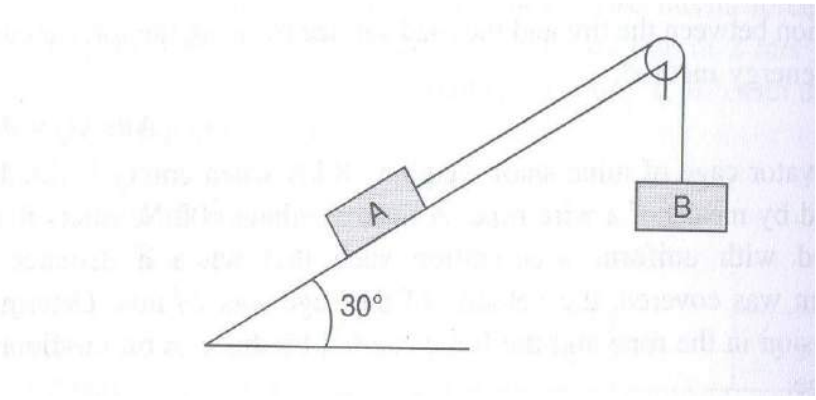

Fig.5

[16]

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 10cm. If the bullet moving with the same velocity were fired into a similar piece of wood 5cm thick, with what velocity would it emerge? Also, find the force of resistance, assuming it to be uniform.

[16]

Subject Code: R13210/R13 **Set No - 4**

I B. Tech II Semester Supplementary Examinations Feb. - 2015

ENGINEERING MECHANICS

(Common to ECE, EEE, EIE, Bio-Tech, E Com.E, Agri. 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.(i) Write about different types of friction.
(ii) What are the equilibrium conditions of a body applied with a system of non-concurrent, coplanar forces?
(iii) Derive the centre of gravity of a 'T' section of web 15mm x 150mm and flange 15mmx150mm.
(iv) Derive an expression for the moment of inertia of a triangular section about an axis passing through the C.G of the section and parallel to the base.
(v) Differentiate between kinematics and kinetics
(vi) Derive the equation for the work done by a Torque.

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

PART –B

2. Determine the horizontal force P required for wedge B to raise block A of weight 5000N as shown in fig.1. The coefficient of friction on all surfaces is equal to 0.4.

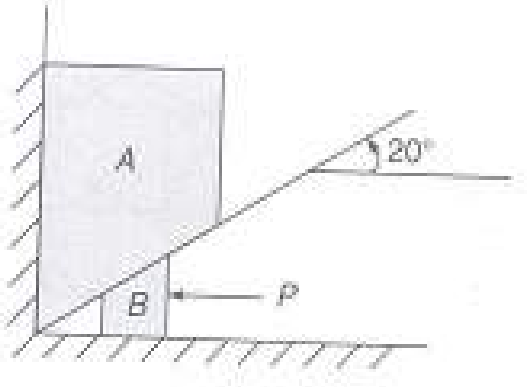

Fig.1

[16]

|''|''|||''|'''|||'|

3. Two identical rollers, each weighing 120 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.

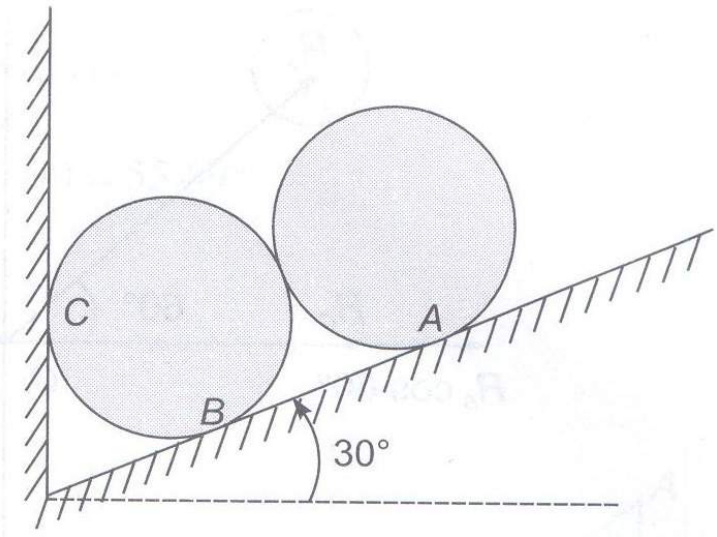

Fig2.

[16]

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

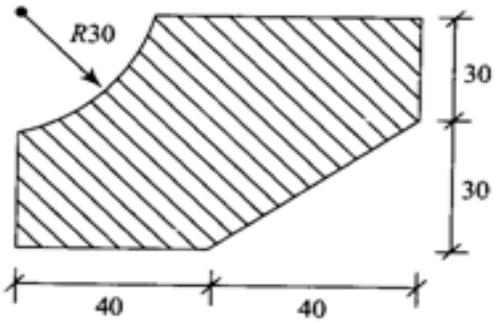

Fig.3

(b) State and prove Parallel Axis theorem.

[8+8]

5. Find the area moment of inertia about the centroidal axes for the area shown in the fig.4.

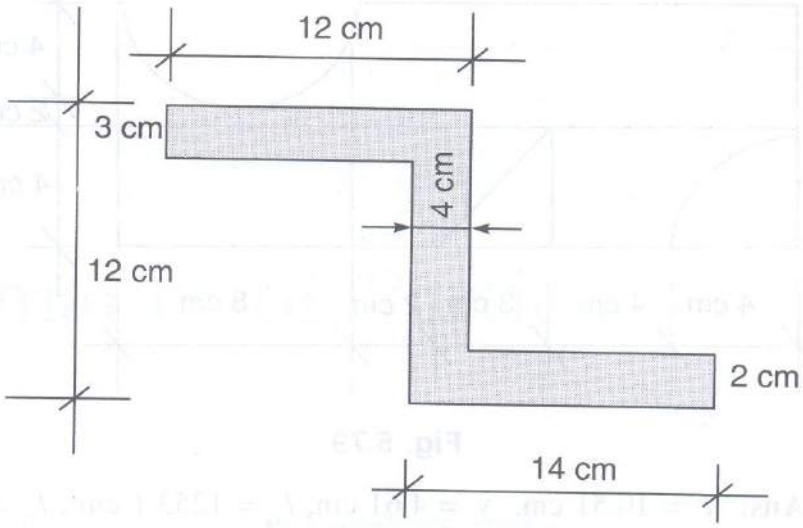

Fig.4

[16]

6. Write about
   (a) Coplanar and non coplanar forces
   (b) Concurrent and non concurrent forces
   (c) Equations of plane motion.
   (d) Area moment of inertia and Mass moment of inertia.

[4+4+4+4]

7. A bullet of mass 90gm and moving with a velocity 270m/s is fired into a block of wood and it penetrates to a depth of 10cm. 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]