Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

First Semester B. Tech. (All Branches)

Summer Term – 2017

Course Code: CEU101

Course Name: Engineering Mechanics

Time: 2 Hrs.30 Min. **Max. Marks: 60**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
3) Diagrams/sketches should be given wherever necessary.
4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.

Q.1 a) Define (4 marks)

4

i) Cantilever beam

ii) Angle of repose

iii) Centroid

iv) Relative velocity

b) Refer to the system of cylinders of arranged as depicted in figure 1. The cylinder A and B weigh 1000 N each and the weight of cylinder C is 2000 N. Diameter of cylinder A and B is 0.60 m each and cylinder C is 1.2 m. Determine the forces exerted at the contact points. (6 marks)

6

Cont.

Scanned by CamScanner

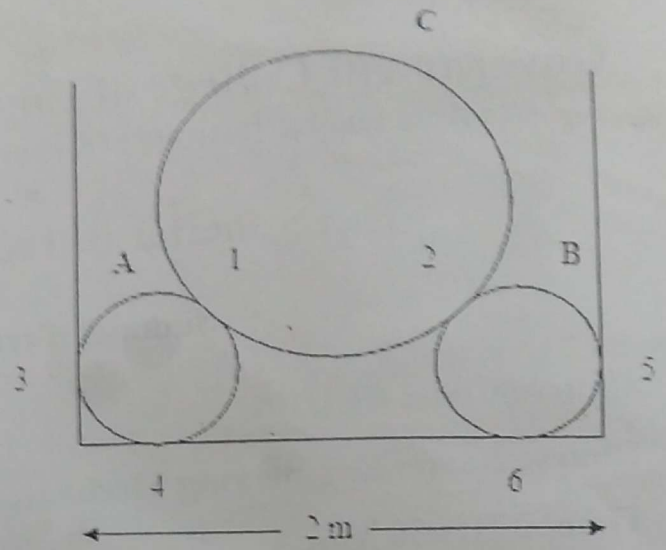

Figure 1

Q.2 a) Determine the forces in members BC, BE and EF of the cantilever truss loaded and supported using method of section as shown in figure 2. (6 marks)

6

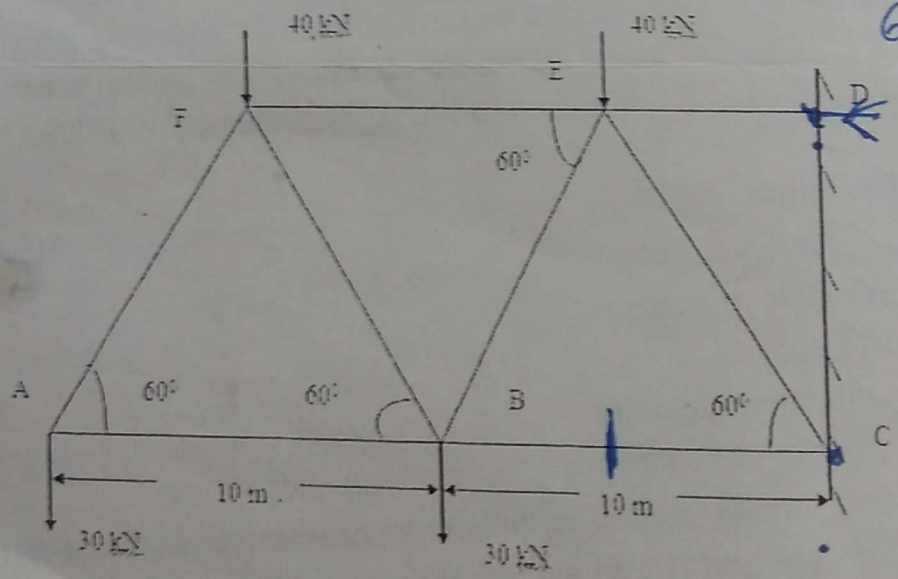

Figure 2

b) A plate measuring 6 m x 4 m is acted upon a set of forces in its plane

Scanned by CamScanner

as shown in figure depicted in figure 3. Determine the magnitude direction and position of the resultant force. (6 marks)

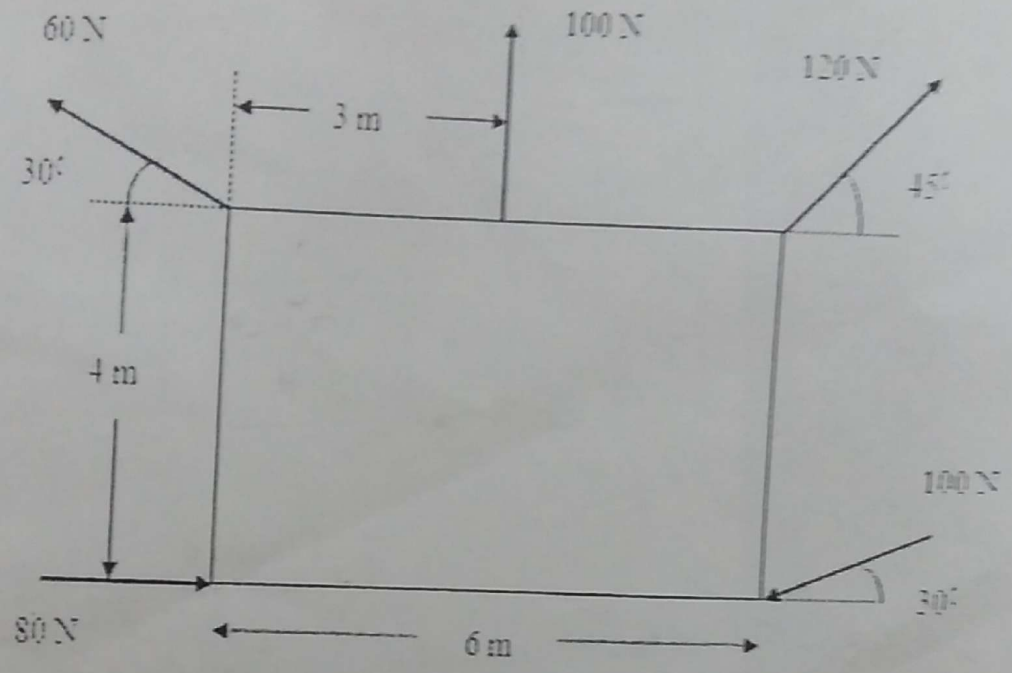

Figure 3

OR

c) Two stones are thrown vertically upwards, one from the ground with a velocity of 30 m/s and the other from a point 40 m above with a velocity 10 m/s. when and where will they meet? (6 marks)

Q.3 a) Two identical blocks A and B are connected by a rod and rest respectively against vertical wall and horizontal floor as shown in figure 4. The sliding motion of the blocks impends when rod makes an angle of 45^0 with the horizontal. Estimate the coefficient of the friction assuming it to be same both at the floor and wall. (8 marks)

Cont.

Scanned by CamScanner

GOVERNMENT COLLEGE OF ENGIEERING AMRAVATI

(An Auton

ode and name:

te and Explain

t truss

motion

of repose

ne the forces i

e the expr

ratio

ght ro

s from a

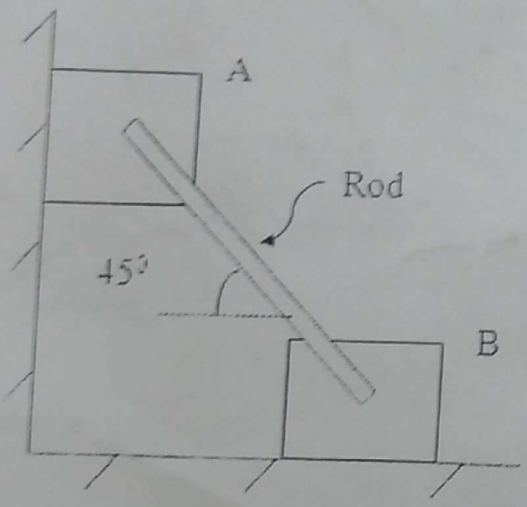

Figure 4

b) Find the Moment of inertia about the centroidal axis of shaded region shown in figure 5. (All dimensions are in cm) (6 marks)

6

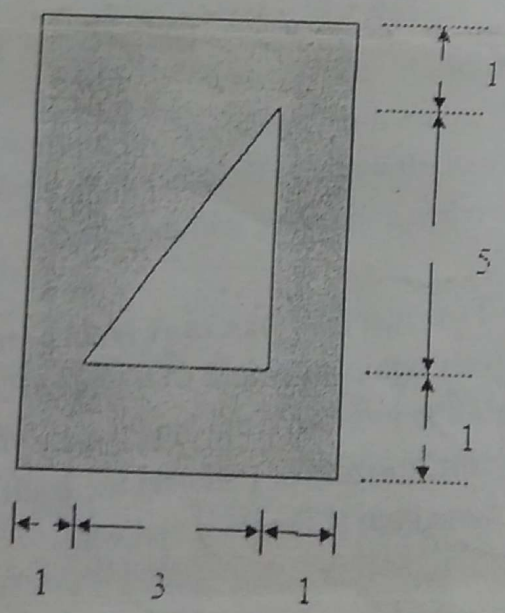

Figure 5

Scanned by CamScanner

Class test-II

Subject code and name:

Q.1

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

First Year B. Tech.

Winter – 2016

Course Code: CEU 101 **Course Name: Engineering Mechanics**

Time: 2 hr 30 min. **Max. Marks: 60**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
3) Diagrams/sketches should be given wherever necessary.
4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.

Q.1 a) Define (4 marks)

i) Hinged support
ii) Wedge
iii) Centroid
iv) Relative velocity

b) A cantilever beam has been loaded as shown in figure 1. Determine the reaction at cantilever end A. (6 marks)

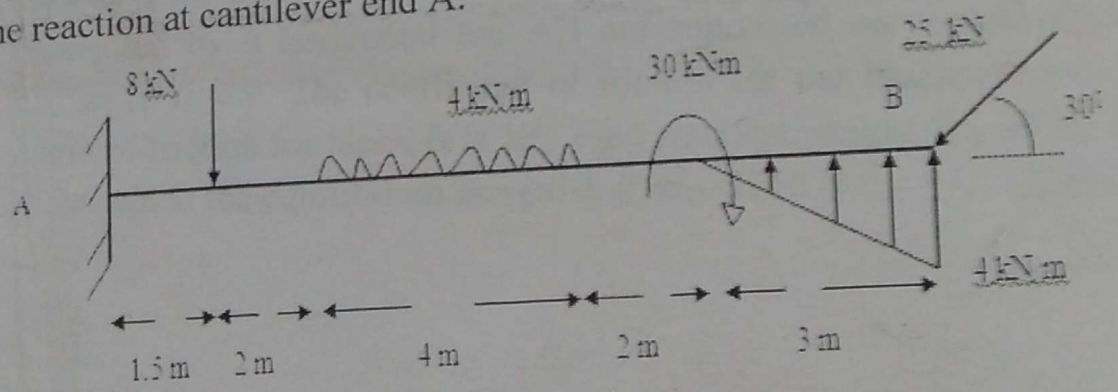

Figure 1

Cont.

Scanned by CamScanner

Q.2 a) A truss has been loaded and supported as shown in figure 2. Make calculations for the reactions at the supports and forces in the members of the truss. (6 marks)

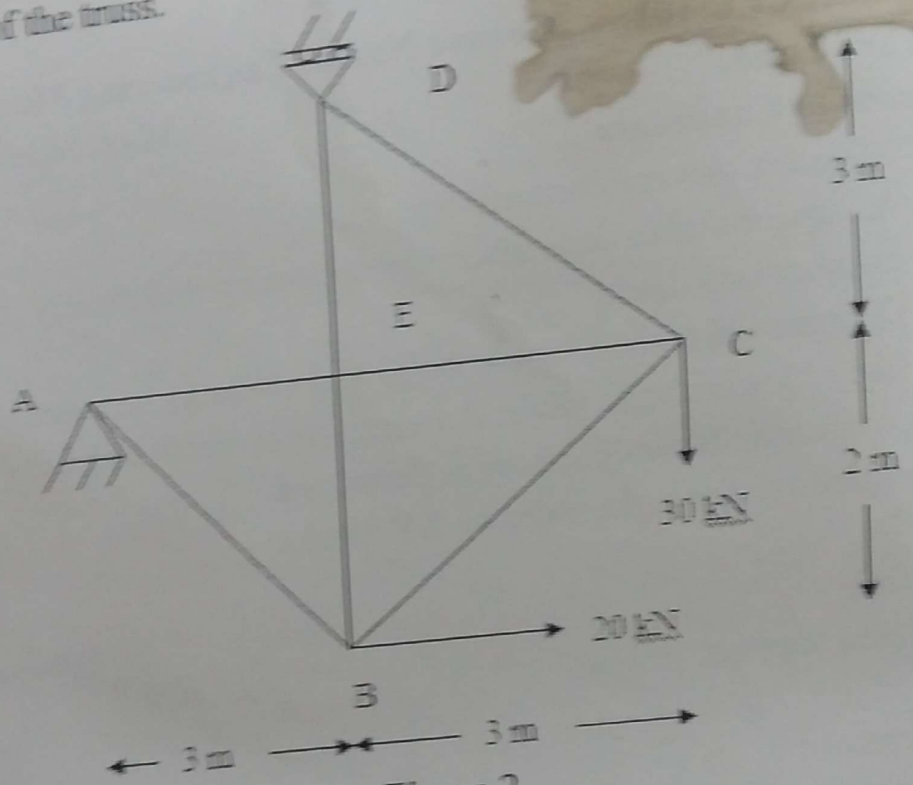

Figure 2

b) Determine magnitude and direction coplanar non concurrent force system shown in figure 3. (6 marks)

Scanned by CamScanner

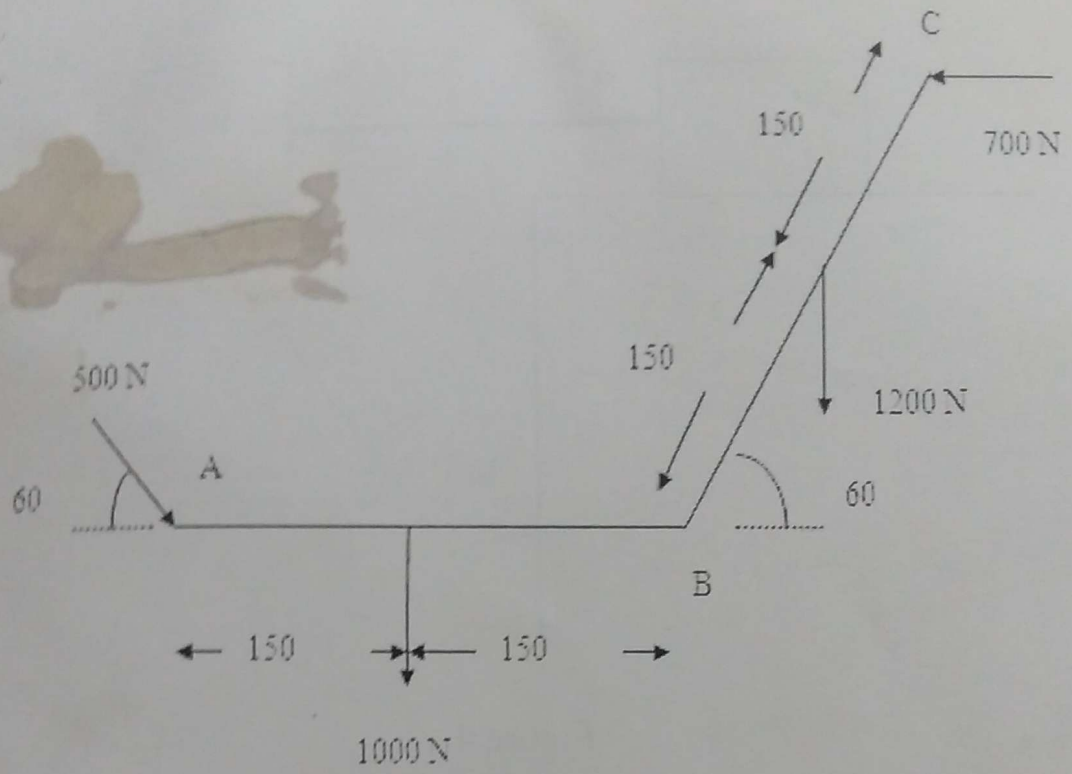

Figure 3

OR

c) A particle falls from rest and in last second of its motion it passes 80 m. find the height from which it fell and the time of its fall. Take g=9.81 m/s^2. (6 marks)

Q.3 a) Two blocks W_1 and W_2 which are connected by bar AB are connected by a horizontal bar AB are supported on rough planes as shown in figure. The coefficient of friction for the block A is 0.4. the angle of friction for block B is 20^0. Find smallest weight W_1 of the block A for which the equilibrium can exist, if W_2=2250 N. (8 marks)

Cont.

Scanned by CamScanner

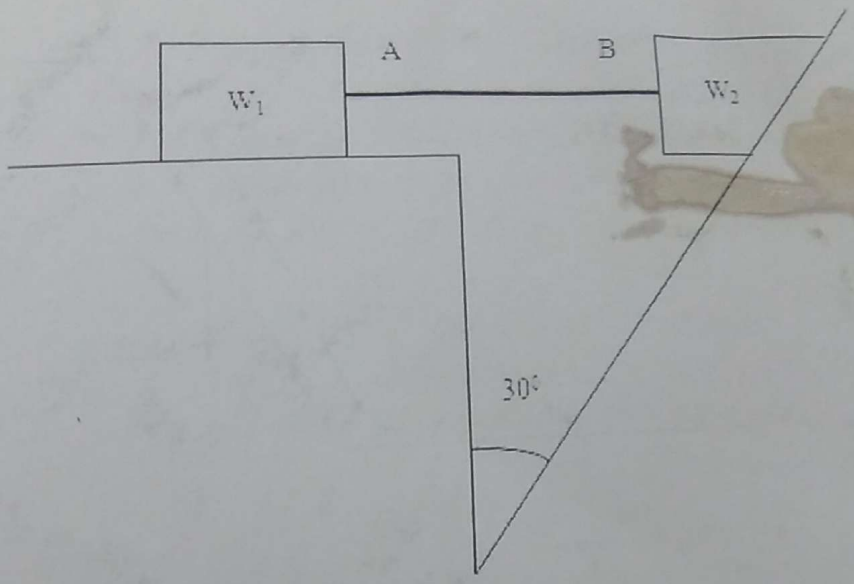

Figure 4

b) Determine the centroid the shaded area shown in figure 5. (6 marks)

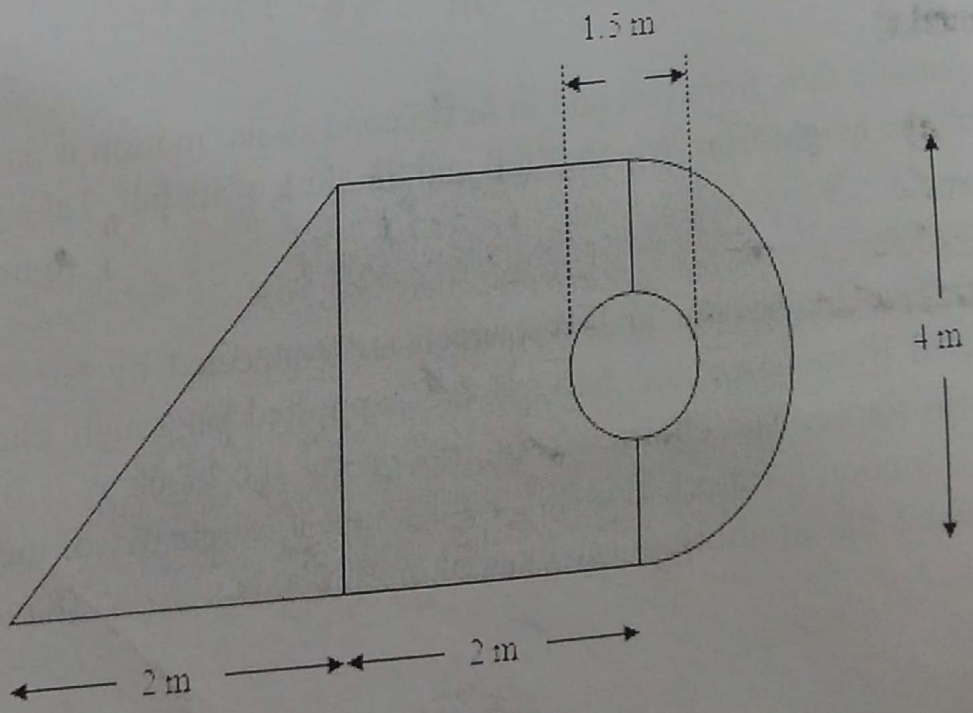

Figure 5

Scanned by CamScanner

Q.4 a) A train takes 2/3 hour while going from station A to station B and also from station B to C. The distance between stations A and B is 25 km and the stations B and C are 40 km apart. Calculate a) The velocity of train at station A and C, and b) The magnitude of acceleration with which the train is running. (6 marks)

b) A particle moves along horizontal direction and its position at any instant is prescribed by relation $x = 3t^3 - 5t^2$ where x is metres and t is in seconds. Make calculations for the following parameters:

i) Displacement during t= 2 sec to 5 sec

ii) Average velocity during t=2 sec to 5 sec and instantaneous at t= 2 sec and 5 sec.

iii) Average acceleration during t= 2 sec and instantaneous acceleration at t= 2 sec and 5 sec.

iv) Distance travelled in the first four second (t= 0 to 4 sec) (8 marks)

OR

c) A particle is moving along straight path. With an acceleration shown in a-t graph in figure, draw v-t and s-t graph. Find maximum velocity in time interval, distance travelled by the particle in time interval (8 marks)

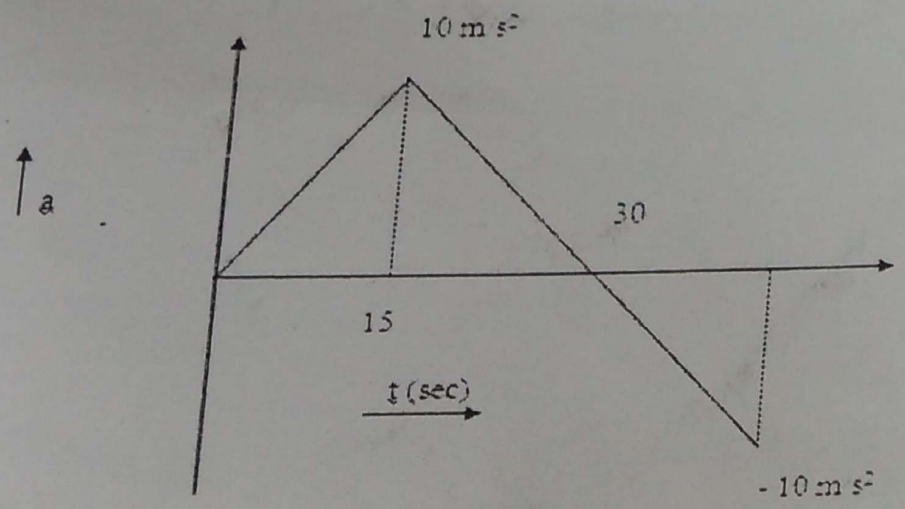

Figure 6

Cont.

Scanned by CamScanner

a) Perfect truss

...ximu

Q.5 a) Prove that work done by force is equal to change in kinetic energy. (4 marks)

OR

b) A train of weight 2000 kN is ascending a slope of 1 in 200 with a uniform velocity of 40 km/hr. find power exerted by the engine if the track resistance is 10 N/kN weight of the train. (4 marks)

c) A body of mass 20 kg falls on the ground from a height of 25 m. the body penetrates into the ground. Find the distance through which the body penetrates into the ground, if the resistance by ground is constant and equals to 5000 N. (6 marks)

(4 M

Scanned by CamScanner

OR

The velocity of the particle is given by equation $v = (8-0.02s)$ where v is the velocity in m/sec and s is the displacement in metres. Knowing t=0, s=0, determine the i) distance traveled before the particle comes to rest ii) acceleration at start and iii) time required for 100 m displacement. **(8)**

Q.5 a) A motorist travelling at a speed of 70 kmph suddenly applies brakes and halts after skidding 50 m. Determine

i) The time required to the car

ii) The coefficient of friction between the tyres and the road. **(4)**

OR

b) An elevator cage of a mine shaft weighing 8 kN, when empty, is lifted or lowered, by means of a wire rope. Once a man weighing 600 N, entered it and lowered with uniform acceleration such that when a distance of 187.5 m was covered, the velocity of the cage was 25 m/sec. determine the tension in the rope and the force exerted by the man on the floor of the cage. **(4)**

c) Two bodies weighing 300 N and 450 N are hung to the ends of a rope passing over an ideal pulley as shown in figure. How much distance the blocks will move in increasing the velocity of system from 2 m/sec to 4 m/sec? How much is the tension in the string? Use work energy method. **(6)**

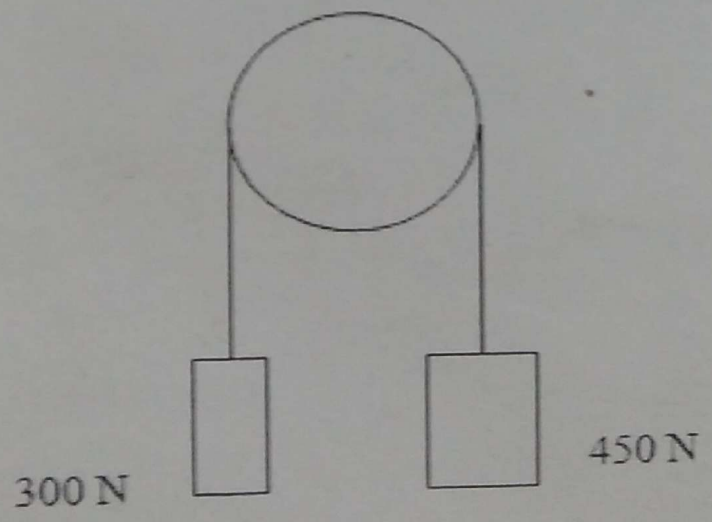

Figure 7

Scanned by CamScanner

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

First Year B. Tech.

Summer – 2016

Course Code: CEU101

Course Name: Engineering Mechanics

Time: 2 hr 30 min. **Max. Marks: 60**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
3) Diagrams/sketches should be given wherever necessary.
4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.

Q.1 a) Select the appropriate answer from the given options. **(4)**

1) A system of three forces acts on a body and keeps it in equilibrium. The forces need to be

a) Coplanar only b)concurrent only c) coplanar as well as concurrent d) coplanar but may or may not be the concurrent

2) A framed structure is said to be perfect if the following correlation exists between the number of joints j and the number of members m.

a) m=2j-2 b) m=3j-3 c) m=2j-3 d) m=2j-1

3) The coefficient of friction between two surfaces is 0.2. Then the angle of friction as

a) $\sin^{-1}(0.2)$ b) $\cos^{-1}(0.2)$ c) $\tan^{-1}(0.2)$ d) $\cot^{-1}(0.2)$

4) A body is allowed to fall from the top of a tower. It is fall through half the height in 2 seconds. The total time taken to reach the ground nearly.

Cont.

Scanned by CamScanner

a) 4.5 sec b) 4 sec c) 3.2 sec d) 2.8 sec

b) A column and cable pulley arrangement supports a load of 4 kN as shown in figure 1. The weight is suspended by the cable and pulley attached at pin C. the pulley has a radius of 15 cm and the weights of column, pulley and cable are negligibly small. Make calculations for fixed support reactions at A of column. (6)

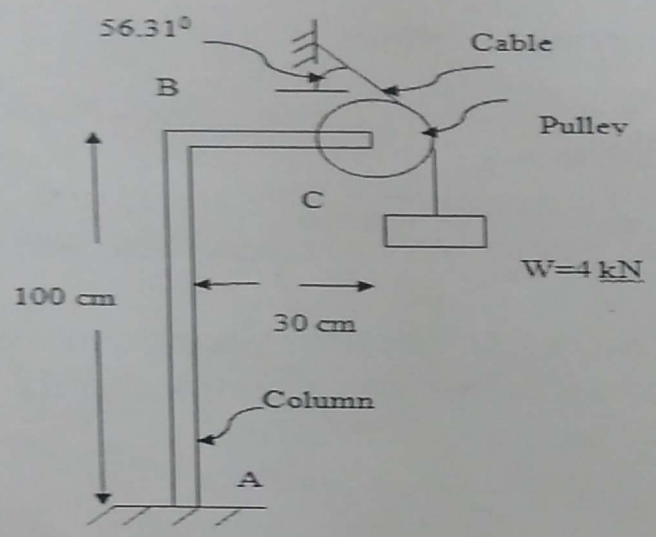

Figure 1

Q.2 a) Determine the forces in the member DE, BD and BC of the truss loaded and supported as shown in figure 2 by method of section. (6)

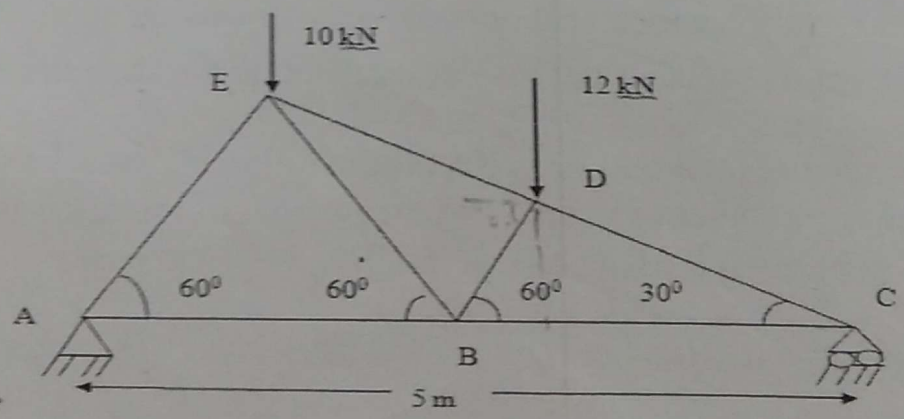

Figure 2

Scanned by CamScanner

shown in
in C. the
cable are
column.
(6)

truss
(6)

b) For the system shown in figure 3, determine

i) The required value of α if the resultant of three forces is to be vertical and

ii) The corresponding magnitude of resultant. **(6)**

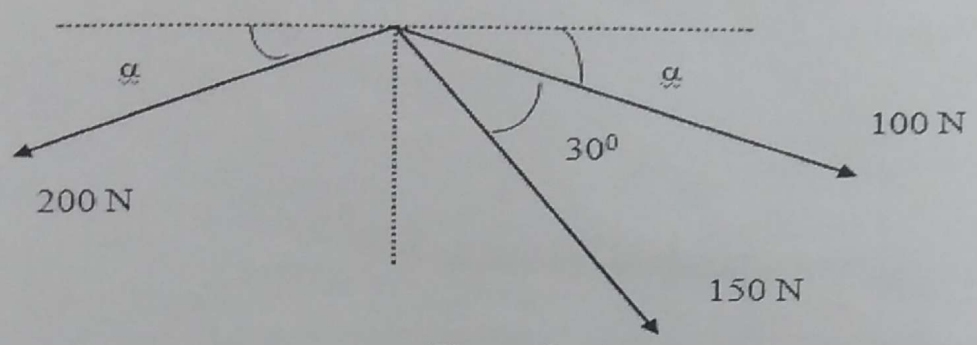

Figure 3

OR

c) A stone is dropped into a well with no initial velocity and 4.5 sec later a splash is heard. If the velocity of sound is constant 330 m/s, find depth of the well up to water level. **(6)**

Q.3 a) An area in shape of a semi circle of 10 cm radius has been punched from a square plate of 50 cm x 50 cm on size as shown in figure 4. If the centroid of the remainder piece is to be kept he same as for the original piece, make calculations for the width *w* of area, shown hatched, that needs to be removed. **(6)**

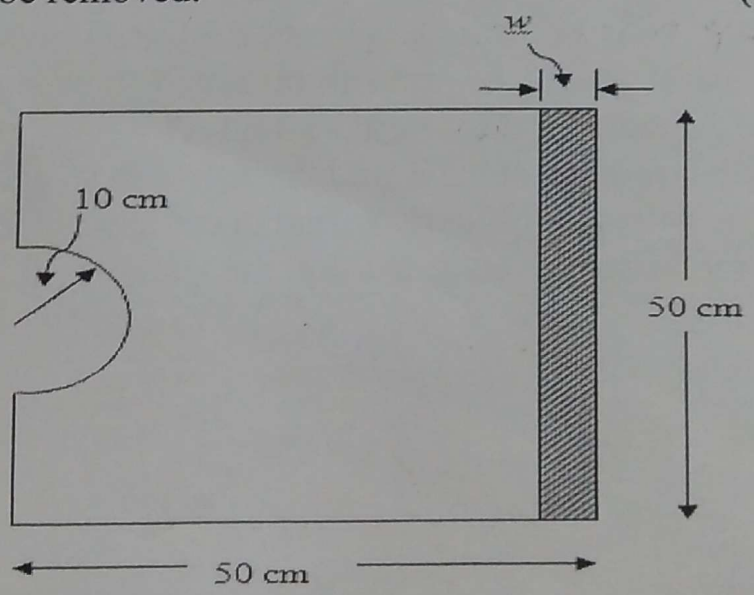

Figure 4

Cont.

Scanned by CamScanner

b) Two identical blocks A and B connected by a rod and rest respectively against vertical will and horizontal floor as shown in figure 5. The sliding motion of the blocks impends when rod makes an angle of 45^0 with the horizontal. Estimate the coefficient of friction assuming it to be same for the floor and wall. **(8)**

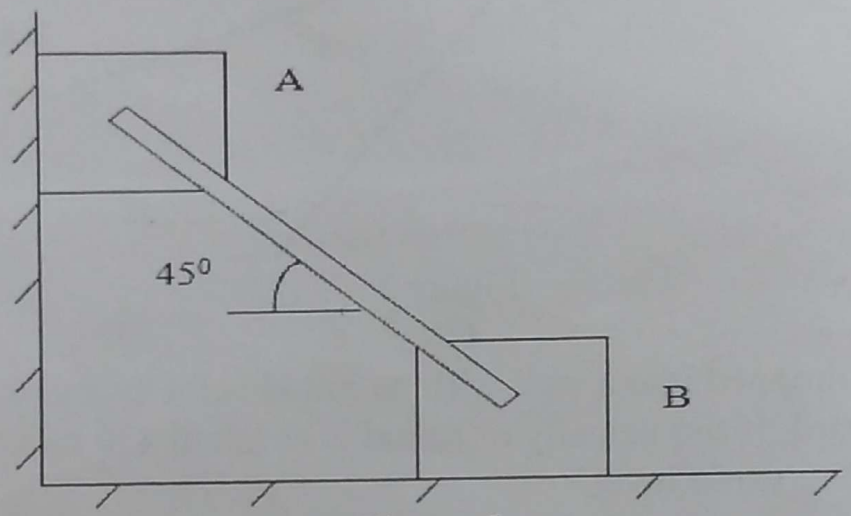

Figure 5

Q.4 a) Train A starts with uniform acceleration of 0.25 m/s^2, attains a speed of 45 kmph which subsequently remains constant. One minute after the start of train A, another train B starts on a parallel track with uniform acceleration of 0.45 m/s^2. If the maximum speed gained by train is 60 kmph, how much time does it take for the train B to overtake train A? **(6)**

b) A particle is moving along a straight path with an acceleration shown in the a-t graph in figure 6. Find maximum velocity in the time interval, distance travelled by the particle in the time interval. **(8)**

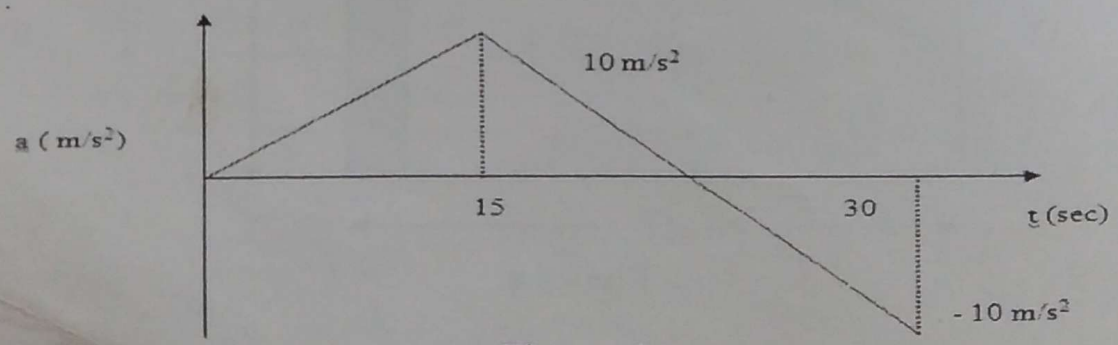

Figure 6

Scanned by CamScanner

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

First Year B. Tech.

Winter – 2016

Course Code: CEU 101 **Course Name: Engineering Mechanics**

Time: 2 hr 30 min. **Max. Marks: 60**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
3) Diagrams/sketches should be given wherever necessary.
4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.

Q.1 a) Define (4 marks)

i) Hinged support
ii) Wedge
iii) Centroid
iv) Relative velocity

b) A cantilever beam has been loaded as shown in figure 1. Determine the reaction at cantilever end A. (6 marks)

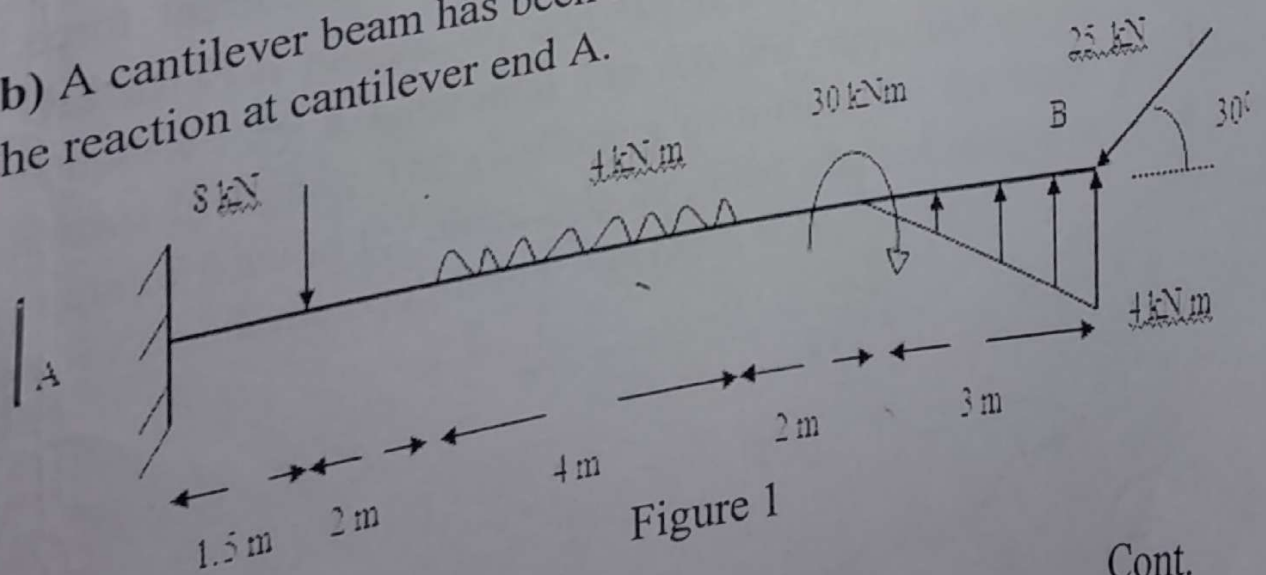

Figure 1

Cont.

Scanned by CamScanner

Q.2 a) A truss has been loaded and supported as shown in figure 2. Make calculations for the reactions at the supports and forces in the members of the truss. (6 marks)

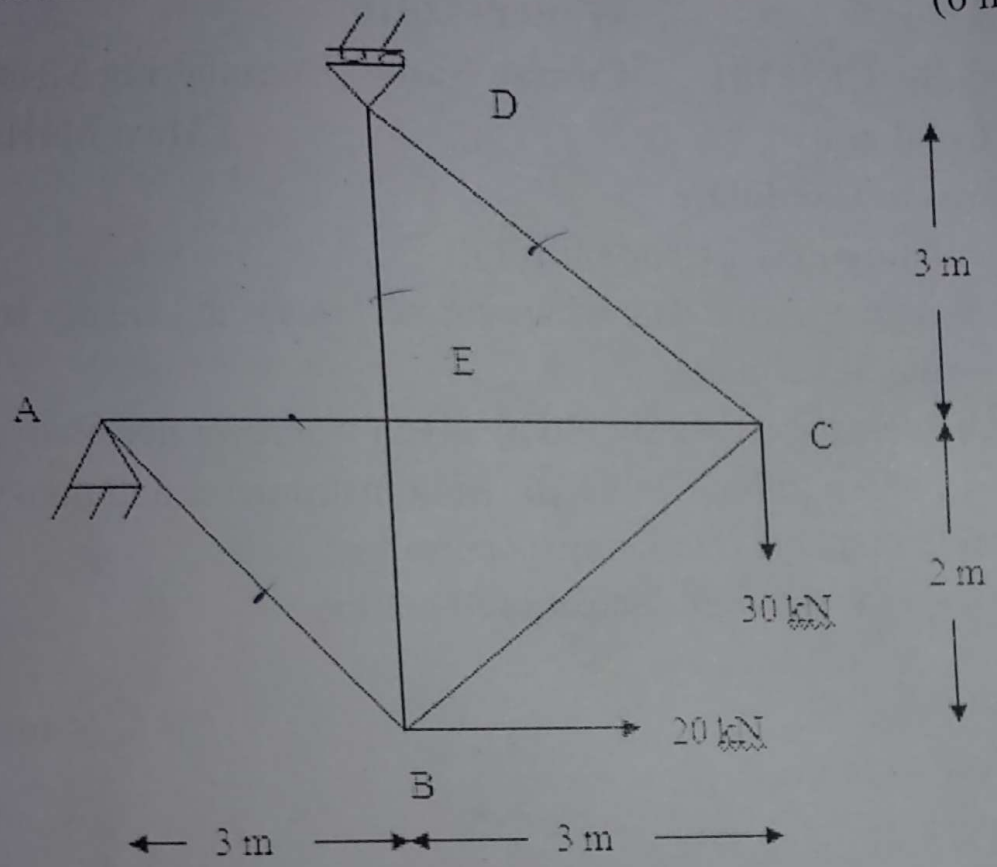

Figure 2

b) Determine magnitude and direction coplanar non concurrent force system shown in figure 3. (6 marks)

Scanned by CamScanner

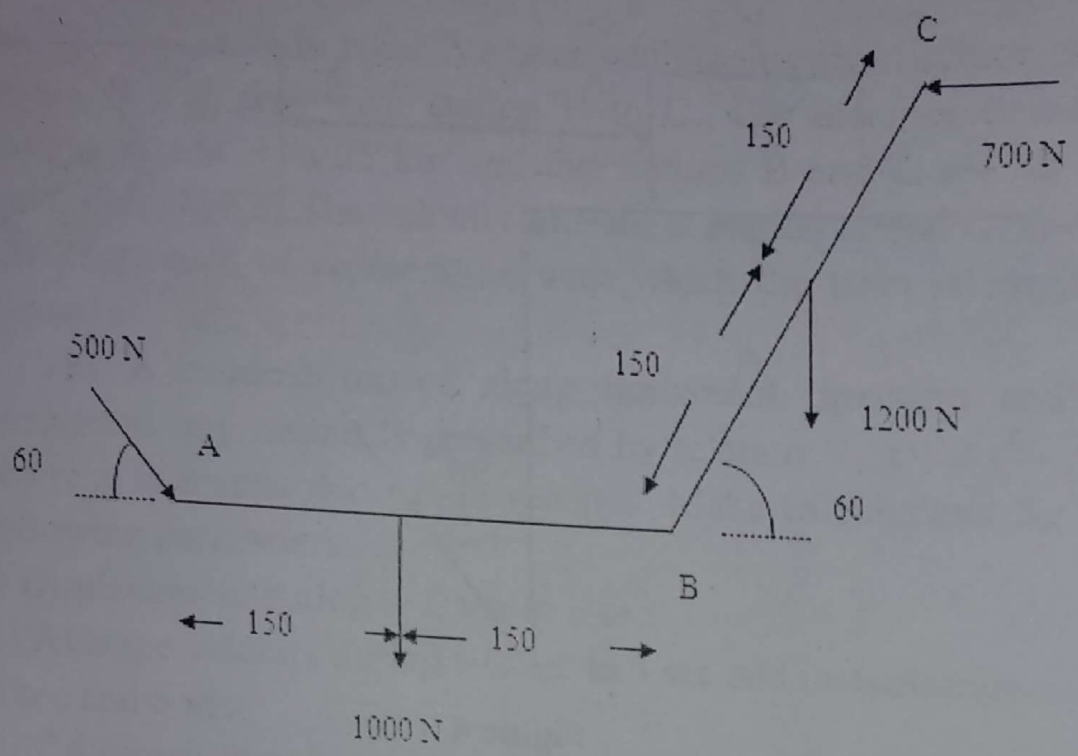

Figure 3

OR

c) A particle falls from rest and in last second of its motion it passes 80 m. find the height from which it fell and the time of its fall. Take g=9.81 m/s^2.

(6 marks)

Q.3 a) Two blocks W_1 and W_2 which are connected by bar AB are connected by a horizontal bar AB are supported on rough planes as shown in figure. The coefficient of friction for the block A is 0.4. the angle of friction for block B is 20^0. Find smallest weight W_1 of the block A for which the equilibrium can exist, if W_2=2250 N.

(8 marks)

Cont.

Scanned by CamScanner

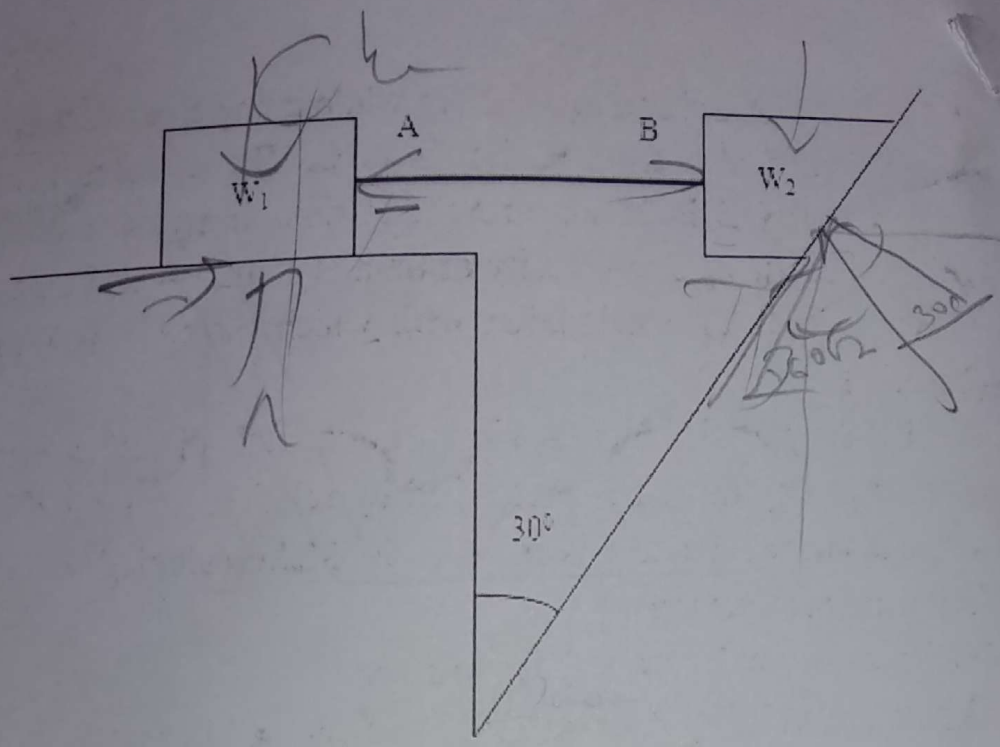

Figure 4

b) Determine the centroid the shaded area shown in figure 5.

(6 marks)

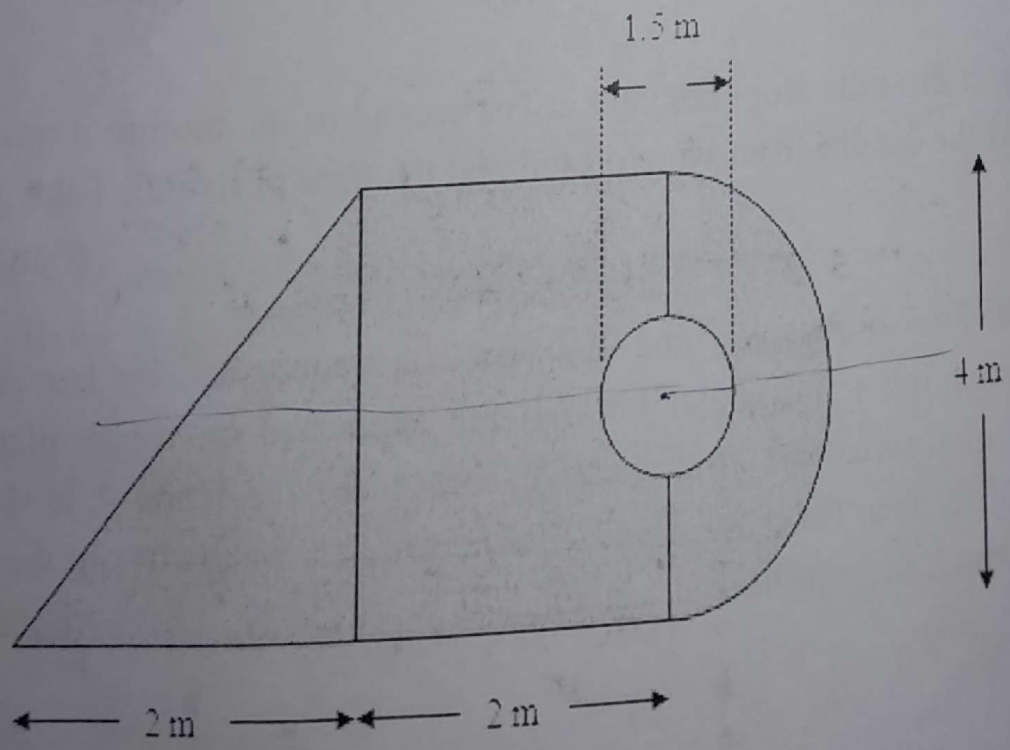

Figure 5

Scanned by CamScanner

Q.4 a) A train takes 2/3 hour while going from station A to station B and also from station B to C. The distance between stations A and B is 25 km and the stations B and C are 40 km apart. Calculate a) The velocity of train at station A and C, and b) The magnitude of acceleration with which the train is running. (6 marks)

b) A particle moves along horizontal direction and its position at any instant is prescribed by relation $x = 3t^3 - 5t^2$ where x is metres and t is in seconds. Make calculations for the following parameters:

i) Displacement during t= 2 sec to 5 sec

ii) Average velocity during t=2 sec to 5 sec and instantaneous at t= 2 sec and 5 sec.

iii) Average acceleration during t= 2 sec and instantaneous acceleration at t= 2 sec and 5 sec.

iv) Distance travelled in the first four second (t= 0 to 4 sec) (8 marks)

OR

c) A particle is moving along straight path. With an acceleration shown in a-t graph in figure, draw v-t and s-t graph. Find maximum velocity in time interval, distance travelled by the particle in time interval (8 marks)

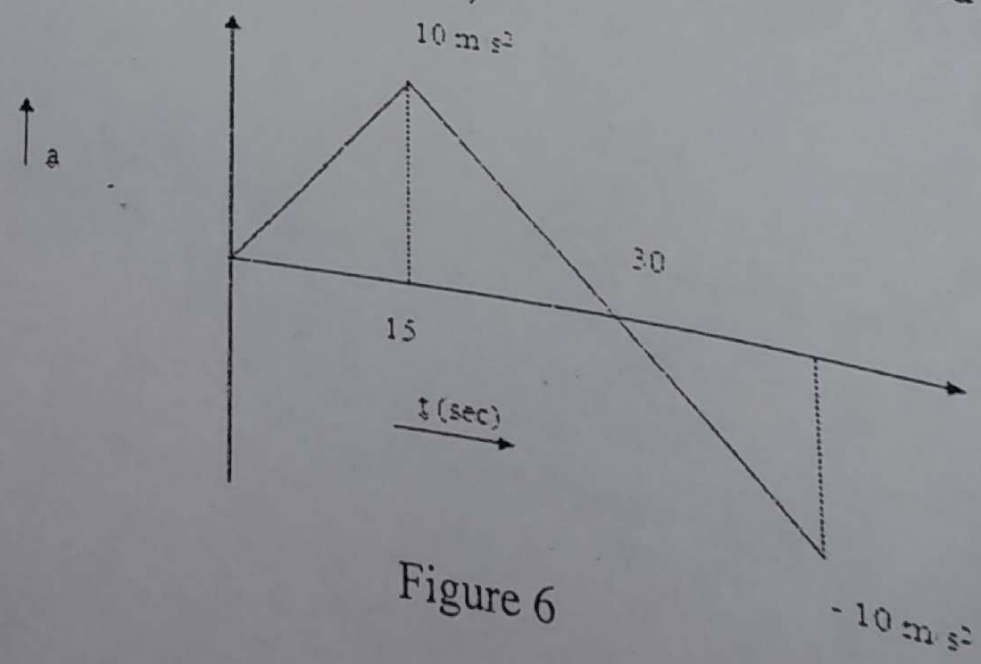

Figure 6

Scanned by CamScanner

Q.5 a) Prove that work done by force is equal to change in kinetic energy.

(4 marks)

OR

b) A train of weight 2000 kN is ascending a slope of 1 in 200 with a uniform velocity of 40 km/hr. find power exerted by the engine if the track resistance is 10 N/kN weight of the train. (4 marks)

c) A body of mass 20 kg falls on the ground from a height of 25 m. the body penetrates into the ground. Find the distance through which the body penetrates into the ground, if the resistance by ground is constant and equals to 5000 N.

(6 marks)

Scanned by CamScanner

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

First Semester B. Tech. (All Branches)

Summer Term – 2017

Course Code: CEU101

Course Name: Engineering Mechanics

Time: 2 hr.30min. **Max. Marks: 60**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
3) Diagrams/sketches should be given wherever necessary.
4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.

Q.1 a) Define (4 marks)

i) Simply supported beam
ii) Angle of friction
iii) Radius of gyration
iv) Relative motion

b) Two smooth spheres P, Q each of radius 25 cm and weighing 500 N, rest in a horizontal channel having vertical walls shown in figure 1. If the distance between the walls is 90 cm, makes calculations for reactions exerted on the wall and floor at the points of contact A, B and C. (6 marks)

Cont.

Scanned by CamScanner

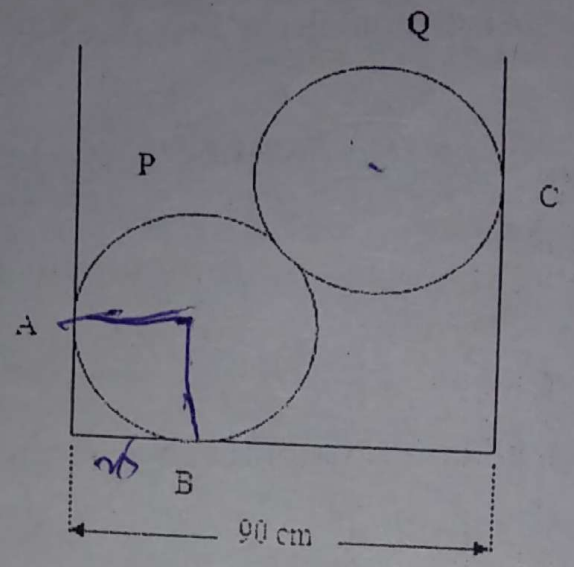

Figure 1

Q.2 a) Determine the forces in various members of the cantilever truss loaded and supported as shown in figure 2. (6 marks)

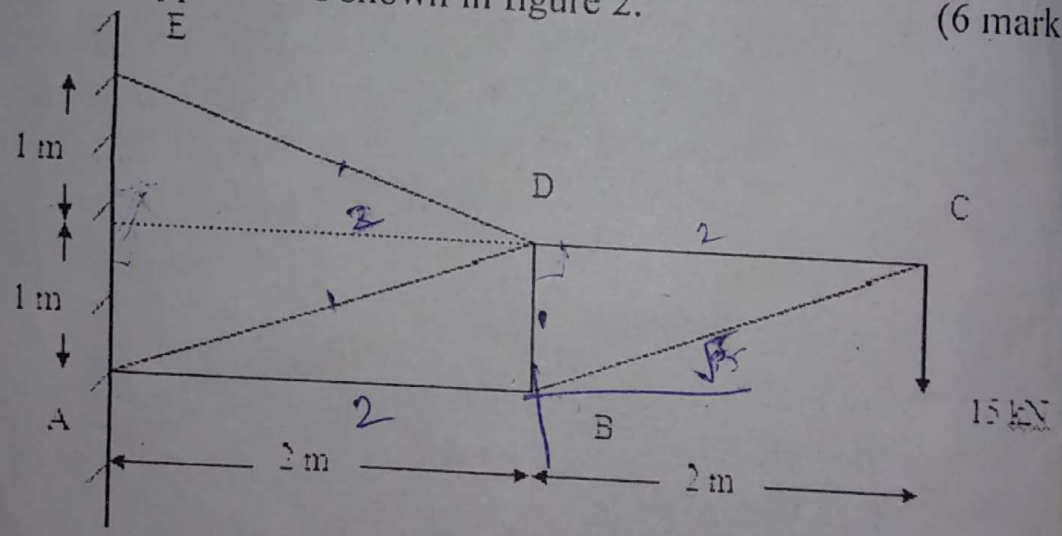

Figure 2

b) Determine magnitude and direction of resul coplanar non concurrent force system shown in figure 3. angler (6 marks)

Scanned by CamScanner

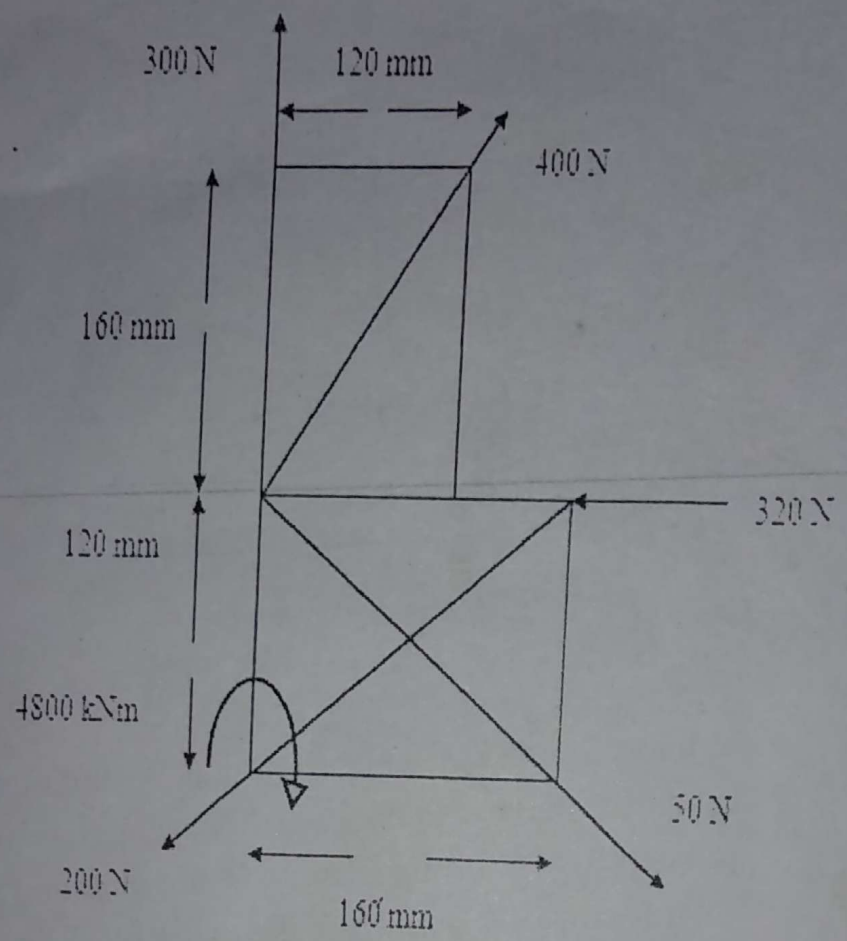

Figure 3

OR

e) A bullet moving at speed of 120 m/s id fired into a log wood. The bullet penetrates to a depth of 0.2 m. if the bullet moving with the same velocity is fired in to similar piece of wood of 0.1 m thick, with what → 620 velocity would it emerge? Assume the resistance to uniform in both the cases.

(6 marks)

Q.3 a) Find the centroid of the following shaded plane areas about axis x and y shown in figure 4. (All dimensions are in mm) (6 marks)

Figure

Cont.

Scanned by CamScanner

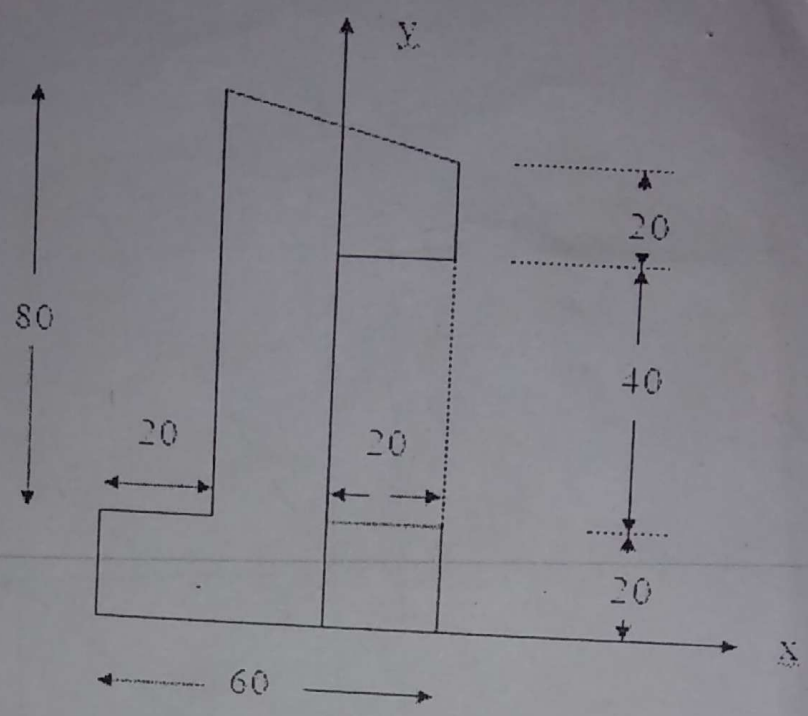

Figure 4

b) Two blocks of weight W_1 and W_2 are connected by a strin and rest on a rough horizontal plane as shown in figure 5. Set u an expression for the magnitude and direction of the least force that needs to be applied to the upper block to induce sliding. Fo each block and the surface, the coefficient of friction may b taken as μ.

(8 marks

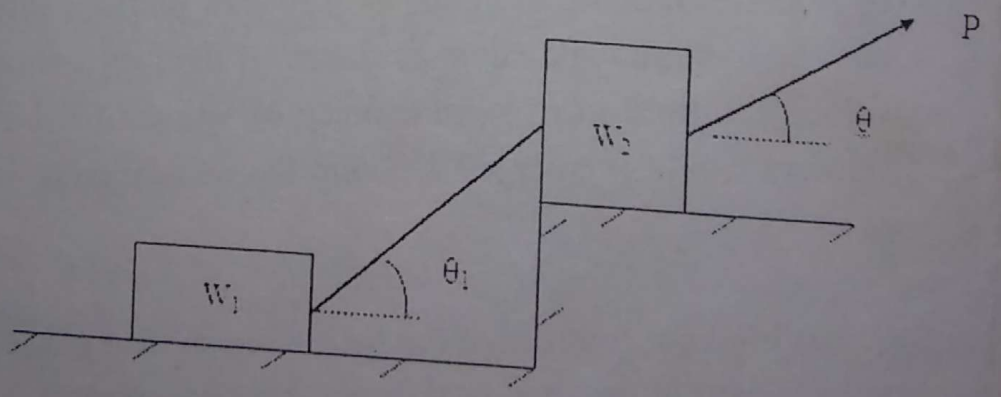

Figure 5

Scanned by CamScanner

Q.4 a) Determine the time required for a car to travel 1 km along a road if the car starts from rest, reaches a maximum speed at some intermediate point, and stops at end of the road. The car can accelerate or decelerate at 1.5 m/sec^2. (6 marks)

3.6510 sec

b) A particle starting from rest, moves in straight line, whose acceleration is given by $a=10-0.006s^2$, where a is in m/s^2 and s is in metres. Determine a) the velocity of the particle when it has travelled 50 m and b) the distance travelled by the particle, when it comes to rest. (8 marks)

50, 0

OR

c) A two-stage rocket is fired vertically from the rest with acceleration as shown in figure 6. After 15 sec the first stage A burns out and the second stage B ignites. Draw v-t curve and s-t curve and Calculate a) Velocity of the rocket at t=15 sec b) Distance travelled by the rocket at t=15 sec c) Velocity of the rocket at t=40 sec d) Distance travelled by the rocket at t=40 sec. (8 marks)

225 800 1687.5 16000

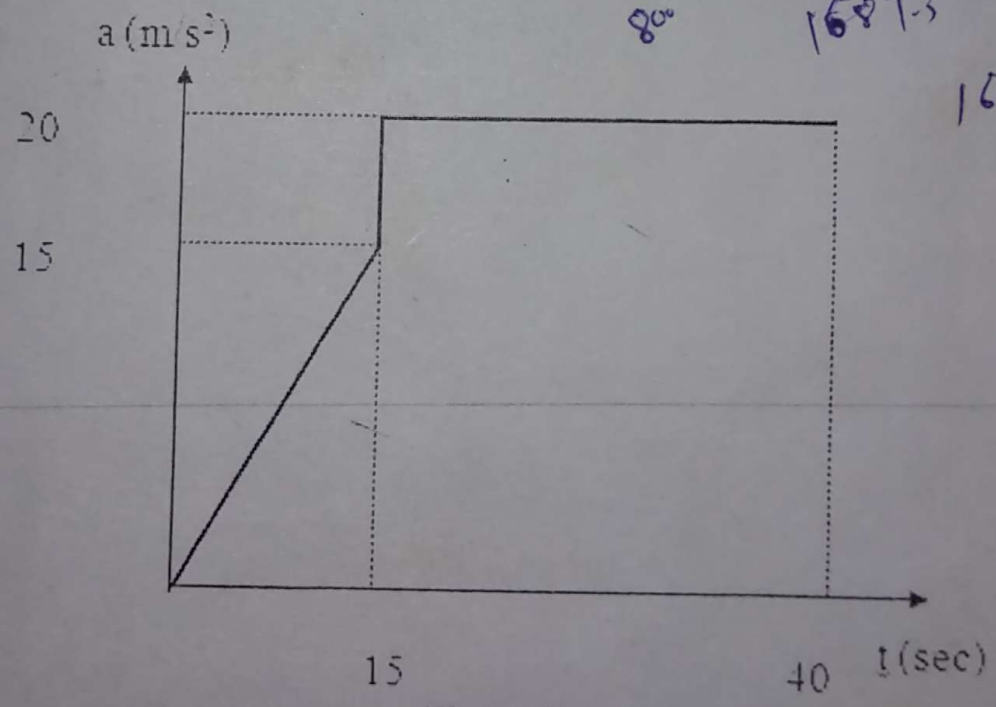

Figure 6

Scanned by CamScanner

Q.5 a) A force of 500 N is acting on a block of mass 50 kg resting on horizontal surface as shown in figure 7. Determine its velocity after the block has travelled a distance of 10 m. coefficient of kinetic friction=0.5.

(4 marks)

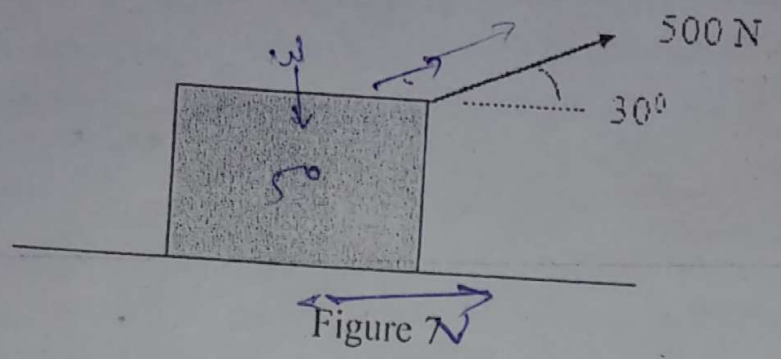

Figure 7

OR

b) Block A has a mass 2 kg and velocity of 5 m/s up the plane shown in figure 8. Use principle of work energy; locate the rest position of block.

(4 marks)

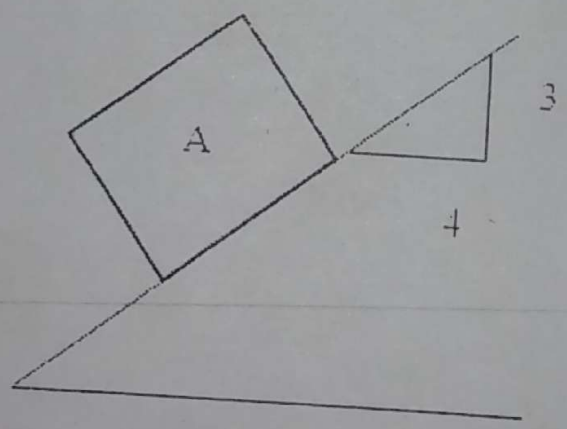

Figure 8

c) A parachute weighing 600 N falling with uniform acceleration from rest descends 6 m in the first four seconds; find the resultant pressure of the air on the parachute.

(6 marks)

Cont.

Scanned by CamScanner

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

First Year B. Tech. (All)
Winter - 2015

Course Code: CEU 101
Course Name: Engineering Mechanics
Time: 2 hr 30 min. **Max. Marks: 60**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
3) Diagrams/sketches should be given wherever necessary.
4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.

Q.1 a) Define (4)

i) Principle of moments
ii) Angle of friction
iii) Plane motion
iv) Power

b) Two spheres of equal radius are connected by flexible string AB. The spheres rest on two mutually perpendicular planes DE and EF as shown in figure 1. Find tension in the string and the angle α it makes with horizontal when the system is in equilibrium. Take Weight of sphere A and B 50 N and 100 N. (6)

Cont.

Scanned by CamScanner

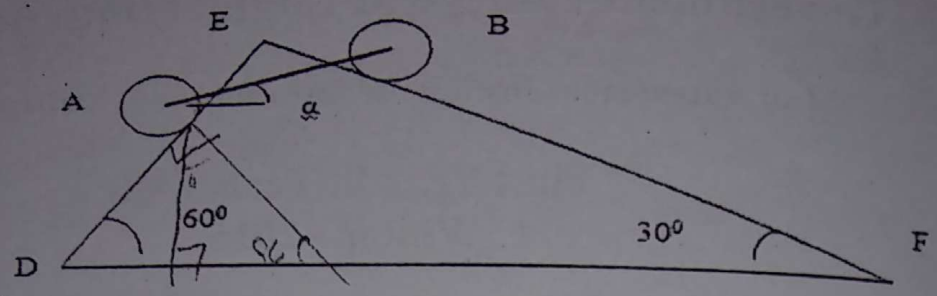

Figure 1

Q.2 a) Make calculations for the load W that would produce a force of magnitude 160 kN (Tension) in the AB member of the cantilever truss in figure 2. For this loading, workout forces in member AE and FE of the truss.

(6)

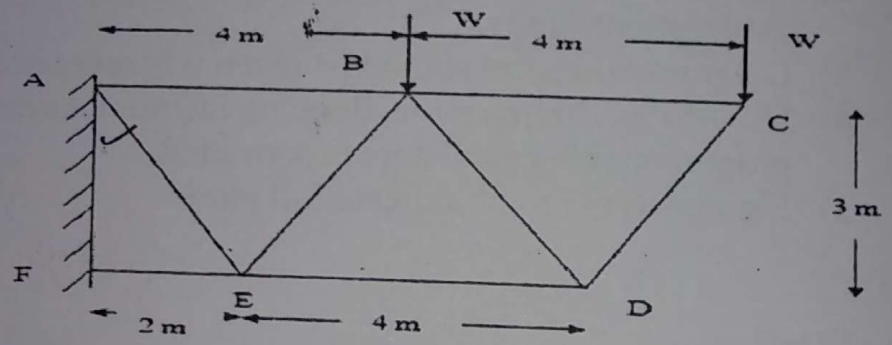

Figure 2

b) A triangular plate ABC is subjected to four coplanar forces as shown in figure 3. Find the resultant completely and locate its position with respect to point A.

(6)

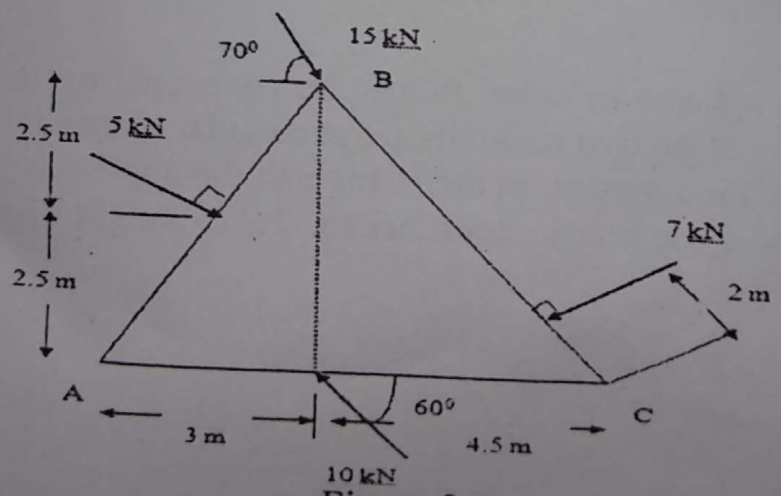

Figure 3

Scanned by CamScanner

OR

c) A body A is projected vertically upwards from the top of a tower with a velocity of 40 m/s, the tower being 180 m high. After t sec, another body B is allowed to fall from the same point. Both the bodies reach the ground simultaneously. Calculate t and the velocities of A and B on reaching the ground. (6)

Q.3 a) Find the moment of inertia about the centroid horizontal axis of the area shown shaded in figure 4. The section consists of triangle ABC, semi-circle BC as diameter and a circular hole of diameter 4 cm with its centre on BC. (6)

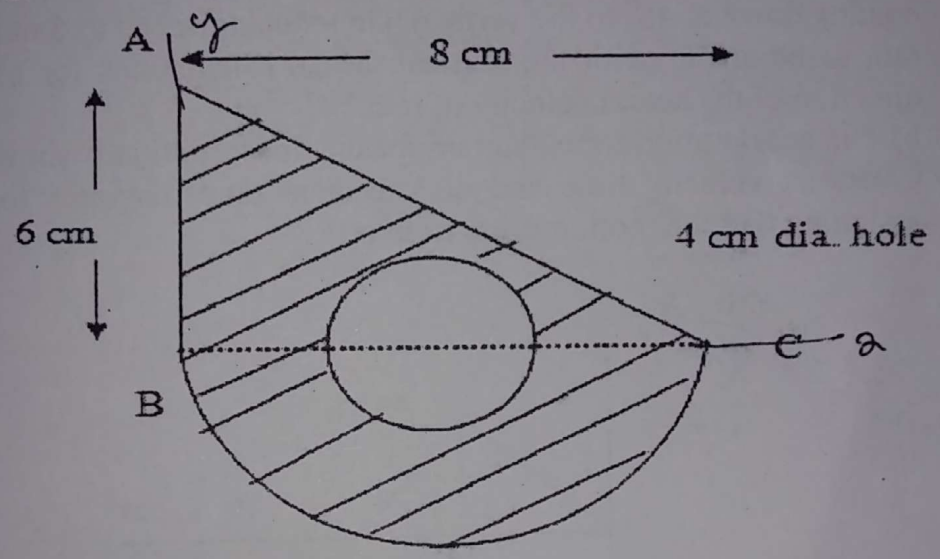

Figure 4

b) Block A of mass 30 kg rests on block B of mass 40 kg as shown in figure 5. Block A is restrained from moving by a horizontal rope tied at point C, what force P applied parallel to the plane inclined at 30^0 with horizontal is necessary to start block B down the plane. Take coefficient of friction for all surfaces as 0.35. (8)

Cont.

Scanned by CamScanner

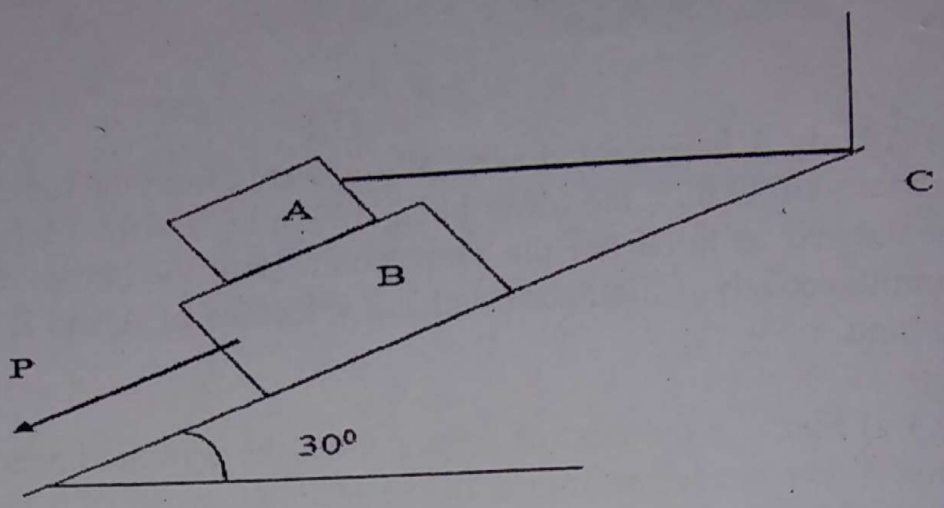

Figure 5

Q.4 a) A motor cyclist travelling west with speed of 10 m/s feels the rain coming down at 45^0 to the vertical. On reducing speed to 6 m/s, he feels the rain to be at 30^0 with the vertical. Make calculations for magnitude and direction of the actual velocity of rain. **(6)**

b) The acceleration-time diagram for the linear motion is shown in figure 6. Construct velocity time and displacement time diagrams for the motion assuming that the motion starts from rest. **(8)**

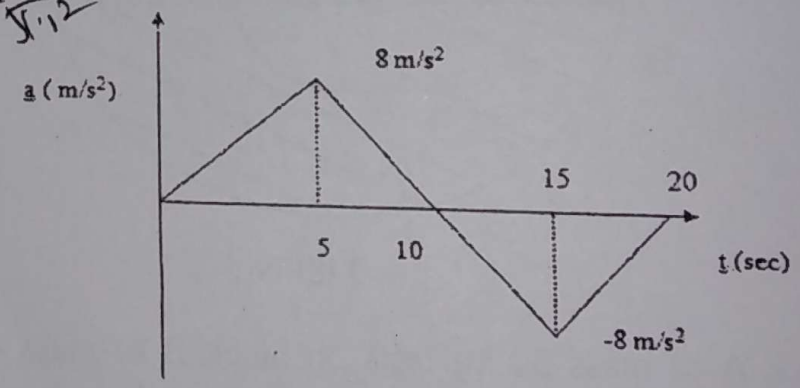

Figure 6

OR

c) A particle moving in positive x direction has an acceleration $a=(100-4v^2)$ m/sec^2 where v is in m/sec determine i) the time interval and displacement of particle when speed changes from 1 m/sec to 3 m/sec ii0 the speed of the particle t=0.05 sec. **(8)**

$$\int \frac{1}{a^2-n^2} = \frac{a^2}{2}\sqrt{a^2-n^2} + \frac{n}{2}\int$$

Scanned by CamScanner

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

First Year B. Tech.

Summer – 2016

Course Code: CEU101

Course Name: Engineering Mechanics

Time: 2 hr 30 min. **Max. Marks: 60**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
3) Diagrams/sketches should be given wherever necessary.
4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.

Q.1 a) Select the appropriate answer from the given options. **(4)**

1) A system of three forces acts on a body and keeps it in equilibrium. The forces need to be

a) Coplanar only b)concurrent only c) coplanar as well as concurrent d) coplanar but may or may not be the concurrent

2) A framed structure is said to be perfect if the following correlation exists between the number of joints j and the number of members m.

a) m=2j-2 b) m=3j-3 c) m=2j-3 d) m=2j-1

3) The coefficient of friction between two surfaces is 0.2. Then the angle of friction as

a) $\sin^{-1}(0.2)$ b) $\cos^{-1}(0.2)$ c) $\tan^{-1}(0.2)$ d) $\cot^{-1}(0.2)$

4) A body is allowed to fall from the top of a tower. It is fall through half the height in 2 seconds. The total time taken to reach the ground nearly.

Cont.

Scanned by CamScanner

a) 4.5 sec b) 4 sec c) 3.2 sec d) 2.8 sec

b) A column and cable pulley arrangement supports a load of 4 kN as shown in figure 1. The weight is suspended by the cable and pulley attached at pin C. the pulley has a radius of 15 cm and the weights of column, pulley and cable are negligibly small. Make calculations for fixed support reactions at A of column. **(6)**

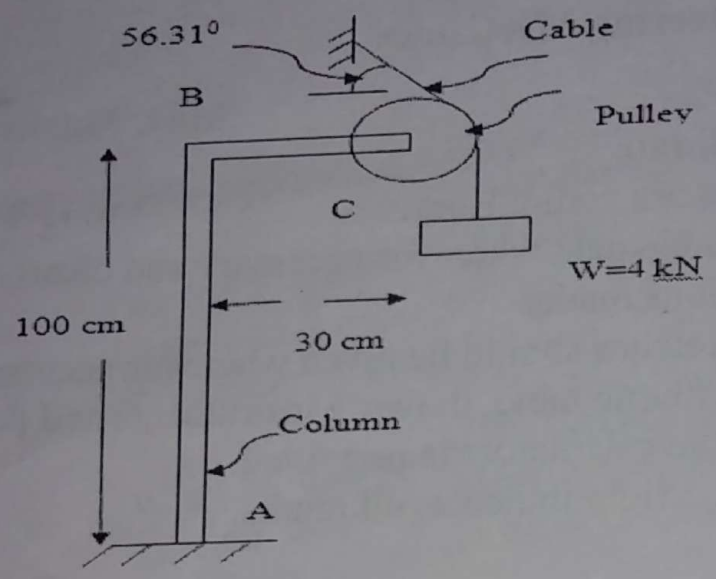

Figure 1

Q.2 a) Determine the forces in the member DE, BD and BC of the truss loaded and supported as shown in figure 2 by method of section. **(6)**

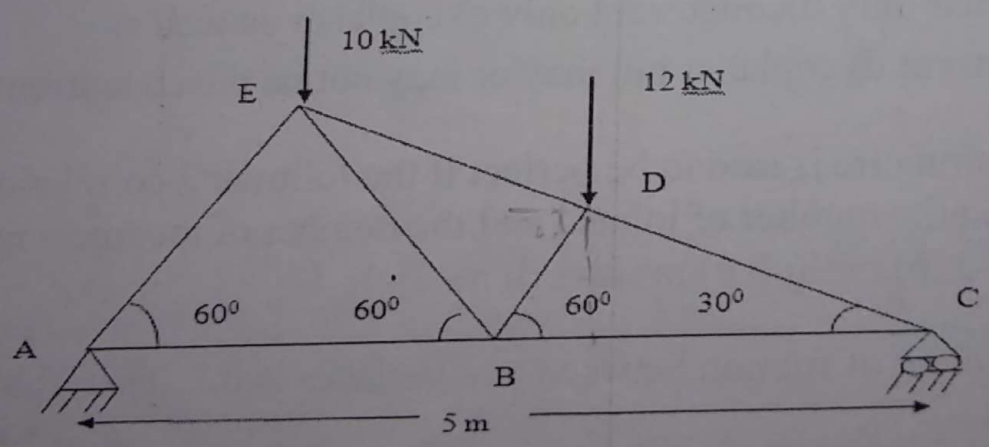

Figure 2

Scanned by CamScanner

b) For the system shown in figure 3, determine

i) The required value of α if the resultant of three forces is to be vertical and

ii) The corresponding magnitude of resultant. **(6)**

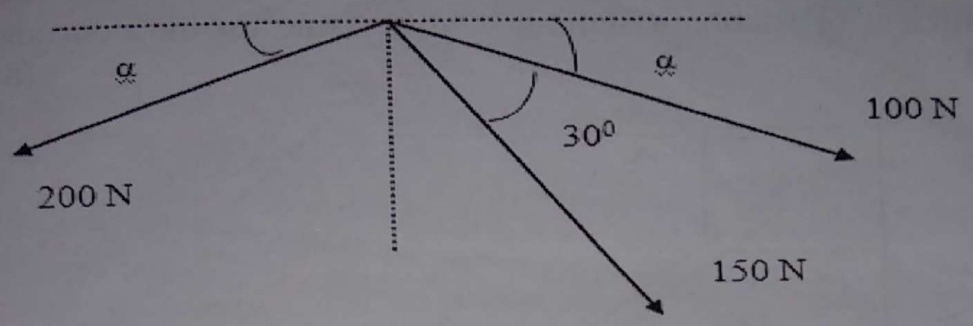

Figure 3

OR

c) A stone is dropped into a well with no initial velocity and 4.5 sec later a splash is heard. If the velocity of sound is constant 330 m/s, find depth of the well up to water level. **(6)**

Q.3 a) An area in shape of a semi circle of 10 cm radius has been punched from a square plate of 50 cm x 50 cm on size as shown in figure 4. If the centroid of the remainder piece is to be kept he same as for the original piece, make calculations for the width *w* of area, shown hatched, that needs to be removed. **(6)**

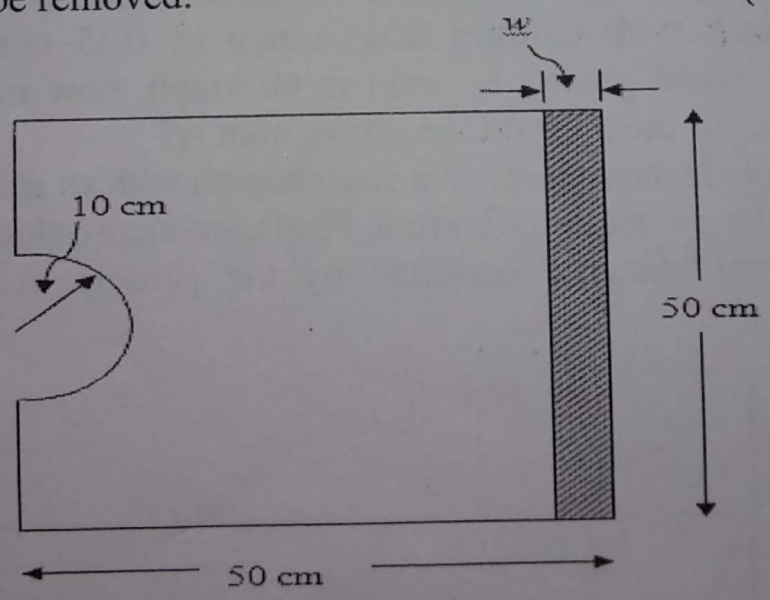

Figure 4

Cont.

Scanned by CamScanner

b) Two identical blocks A and B connected by a rod and rest respectively against vertical will and horizontal floor as shown in figure 5. The sliding motion of the blocks impends when rod makes an angle of 45^0 with the horizontal. Estimate the coefficient of friction assuming it to be same for the floor and wall. **(8)**

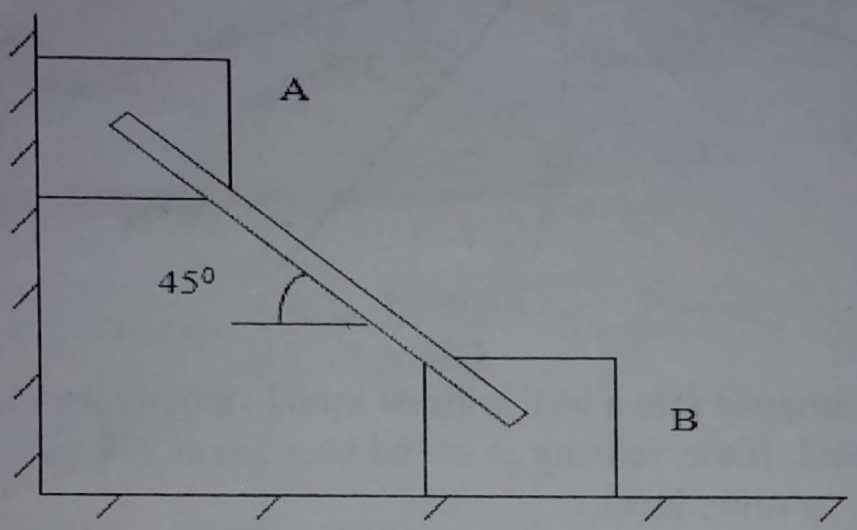

Figure 5

Q.4 a) Train A starts with uniform acceleration of 0.25 m/s^2, attains a speed of 45 kmph which subsequently remains constant. One minute after the start of train A, another train B starts on a parallel track with uniform acceleration of 0.45 m/s^2. If the maximum speed gained by train is 60 kmph, how much time does it take for the train B to overtake train A? **(6)**

b) A particle is moving along a straight path with an acceleration shown in the a-t graph in figure 6. Find maximum velocity in the time interval, distance travelled by the particle in the time interval. **(8)**

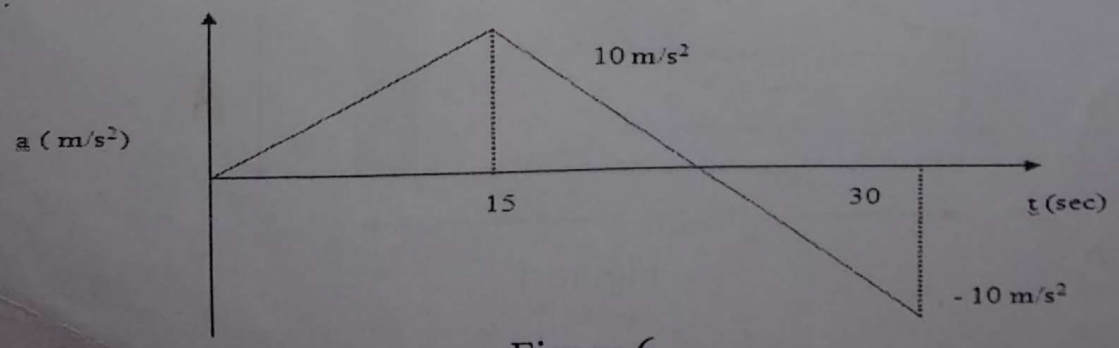

Figure 6

Scanned by CamScanner

Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

First Semester B. Tech. (All Branches)

Summer ~~Term~~ – 2017

Course Code: CEU101

Course Name: Engineering Mechanics

Time: 2 Hrs.30 Min. **Max. Marks: 60**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
3) Diagrams/sketches should be given wherever necessary.
4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.

Q.1 a) Define (4 marks)

i) Cantilever beam

ii) Angle of repose

iii) Centroid

iv) Relative velocity

b) Refer to the system of cylinders of arranged as depicted in figure 1. The cylinder A and B weigh 1000 N each and the weight of cylinder C is 2000 N. Diameter of cylinder A and B is 0.60 m each and cylinder C is 1.2 m. Determine the forces exerted at the contact points. (6 marks)

Cont.

Scanned by CamScanner

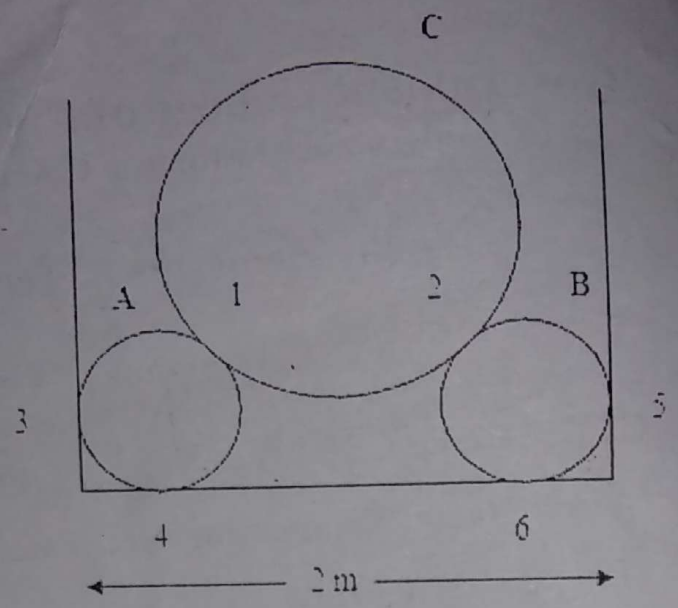

Figure 1

Q.2 a) Determine the forces in members BC, BE and EF of the cantilever truss loaded and supported using method of section as shown in figure 2. (6 marks)

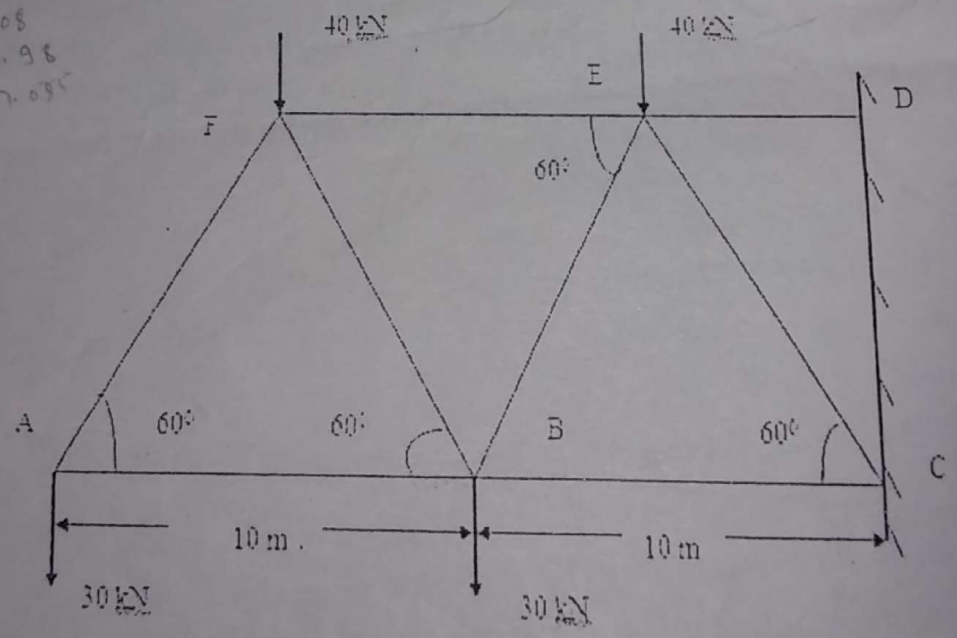

Figure 2

b) A plate measuring 6 m x 4 m is acted upon a set of forces in its plane

Scanned by CamScanner

as shown in figure depicted in figure 3. Determine the magnitude direction and position of the resultant force. (6 marks)

166.93 N , 80.9°

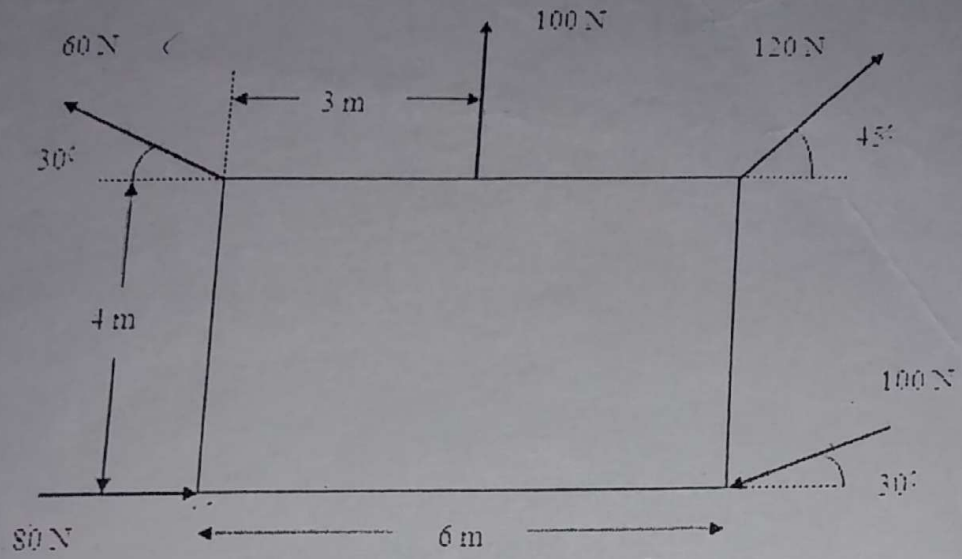

Figure 3

$\Sigma M \times d = R$

$d = \frac{R}{M}$

OR

c) Two stones are thrown vertically upwards, one from the ground with a velocity of 30 m/s and the other from a point 40 m above with a velocity 10 m/s. when and where will they meet? (6 marks)

Q.3 a) Two identical blocks A and B are connected by a rod and rest respectively against vertical wall and horizontal floor as shown in figure 4. The sliding motion of the blocks impends when rod makes an angle of 45^0 with the horizontal. Estimate the coefficient of the friction assuming it to be same both at the floor and wall. (8 marks)

Cont.

Scanned by CamScanner

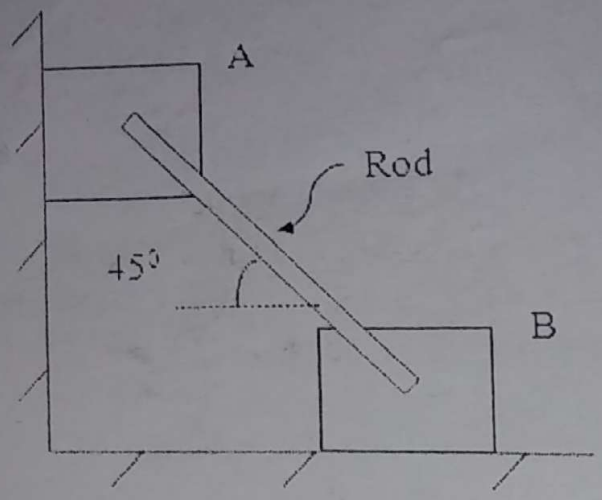

Figure 4

b) Find the Moment of inertia about the centroidal axis of shaded region shown in figure 5. (All dimensions are in cm) (6 marks)

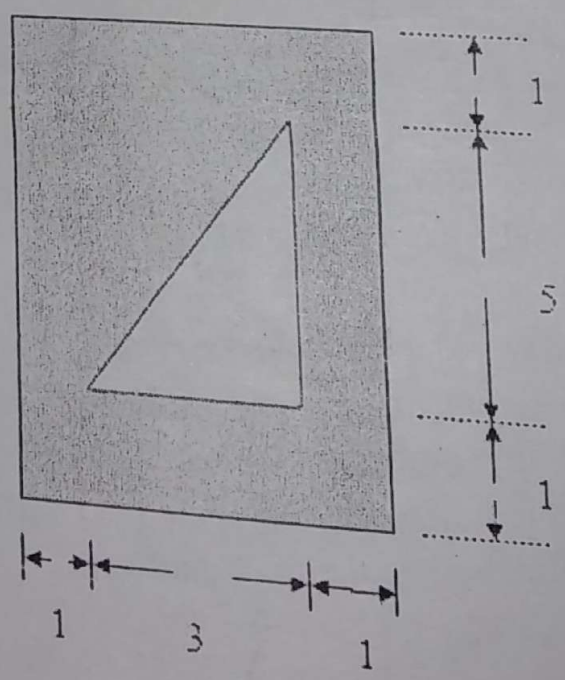

Figure 5

Scanned by CamScanner

Q.4 a) A body is allowed to fall vertically under the action of gravity. It travels two points in its path, placed 45 m apart, in 1 sec. Find from what height above the higher point was the body allowed to fall. (6 marks)

b) The acceleration of the particle moving along the straight line is given by $a=25-3s^2$ where a is in m/s^2 and s is in metres. The particle starts from rest. Find a0 velocity when the displacement is 2 m, b) the displacement when the velocity is zero c) the displacement at maximum velocity. (8 marks)

OR

c) A particle is moving along a straight path variation of its position with respect to time is shown in s-t graph in figure 6. Draw v-t and a-t graph. (8 marks)

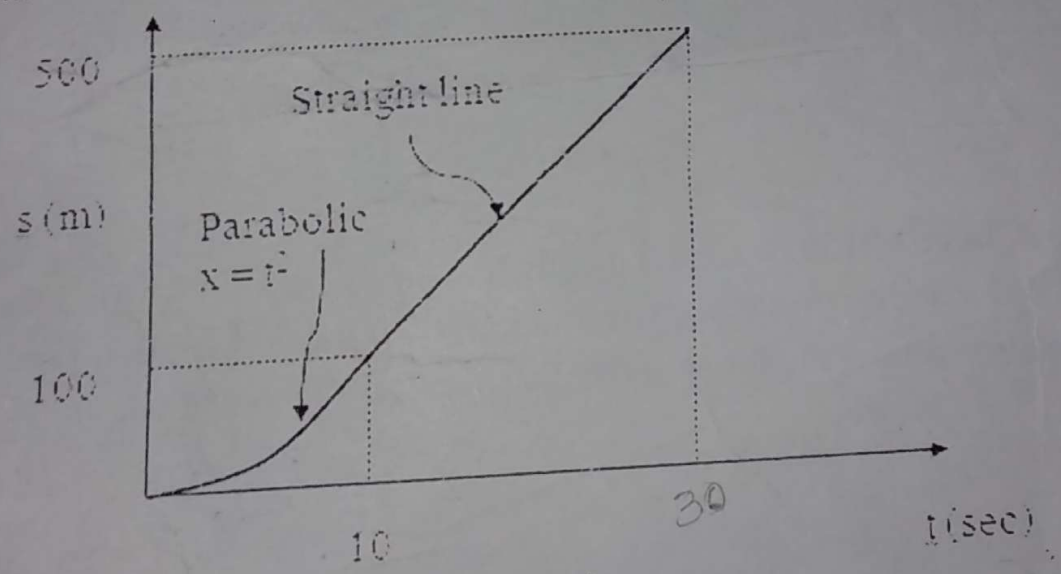

Figure 6

Q.5 a) The 17.5 kN automobile is travelling down the 10^0 inclined road at a speed of 6 m/s. If the driver wishes to stop his car, determine how far s his tyres skid on the road if he jams on the brakes, causing his wheels to lock. The coefficient of kinetic friction between the wheels

Scanned by CamScanner

and the road is 0.5.

(4 marks)

OR

b) Packages are thrown down on incline at A with a velocity of 1.2 m/s as shown in figure 7. The package slide along the surface ABC to a conveyer belt which moves with a velocity of 2.4 m/s. knowing that coefficient of kinetic friction between the packages and the surface ABC is 0.25; determine the distance d if the packages are to arrive at C with a velocity of 2.4 m/s.

(4 marks)

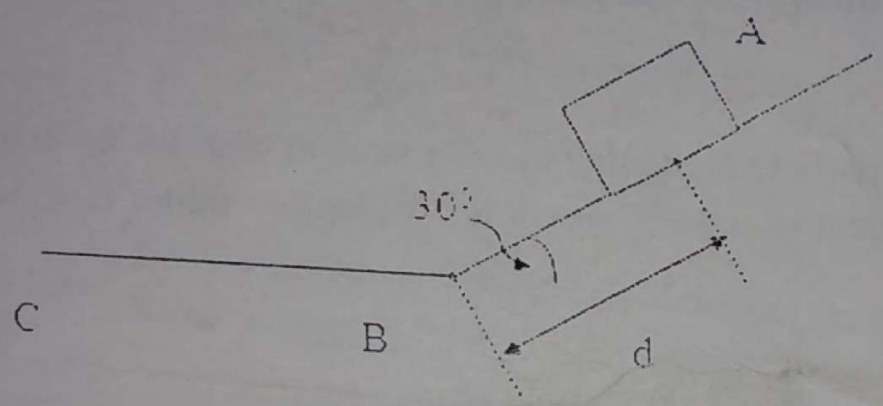

Figure 7

c) A force of 150 N acts on a body having a mass of 3 kg for 3 sec. If the initial velocity of the body is 4 m/s, find a) the acceleration produced in the direction of the force b) the distance moved by the body in 8 sec.

(6 marks)

Cont.

Scanned by CamScanner

OR

c) The velocity of the particle is given by equation v = (8-0.02s) where v is the velocity in m/sec and s is the displacement in metres. Knowing t=0, s=0, determine the i) distance traveled before the particle comes to rest ii) acceleration at start and iii) time required for 100 m displacement. **(8)**

Q.5 a) A motorist travelling at a speed of 70 kmph suddenly applies brakes and halts after skidding 50 m. Determine

i) The time required to the car

ii) The coefficient of friction between the tyres and the road. **(4)**

OR

b) An elevator cage of a mine shaft weighing 8 kN, when empty, is lifted or lowered, by means of a wire rope. Once a man weighing 600 N, entered it and lowered with uniform acceleration such that when a distance of 187.5 m was covered, the velocity of the cage was 25 m/sec. determine the tension in the rope and the force exerted by the man on the floor of the cage. **(4)**

c) Two bodies weighing 300 N and 450 N are hung to the ends of a rope passing over an ideal pulley as shown in figure. How much distance the blocks will move in increasing the velocity of system from 2 m/sec to 4 m/sec? How much is the tension in the string? Use work energy method. **(6)**

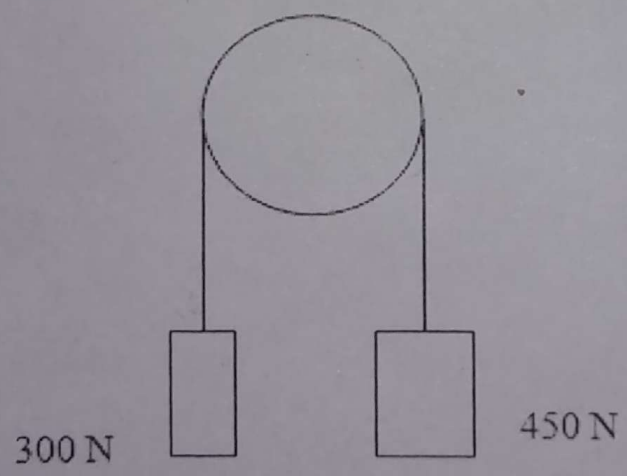

Figure 7

Scanned by CamScanner