c) Determine the second moment of the area of the section with respect to horizontal centroidal axis as shown in Fig.8(c). 10

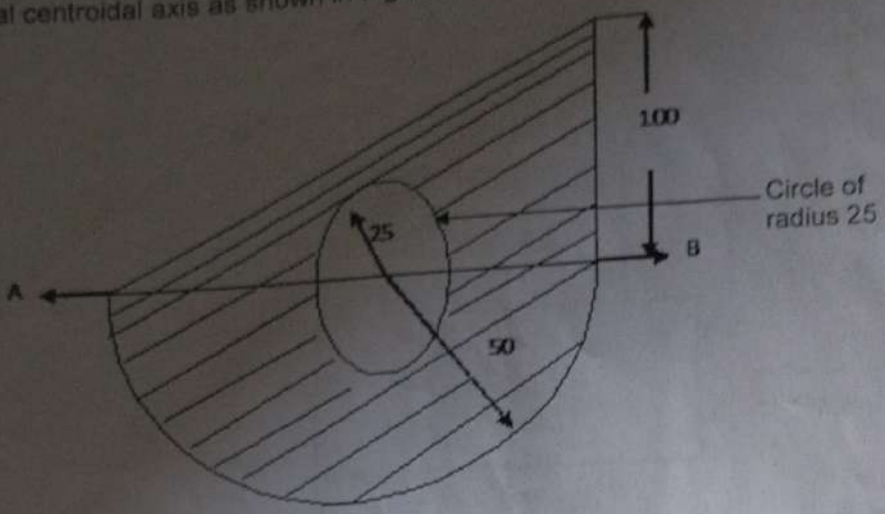

Fig no: 8(C)

Note: All dimensions are in mm

Unit – V

9. a) Define work, energy and power. Derive the work energy formula for the motion of a particle. 8 L1 L4

b) Determine the acceleration of the blocks and tension in the string for the system of blocks connected as shown in Fig.9 Q(b). 8 L5

c) Define co-efficient of restitution. Classify the bodies based on coefficient of restitution. 4 L1 L2

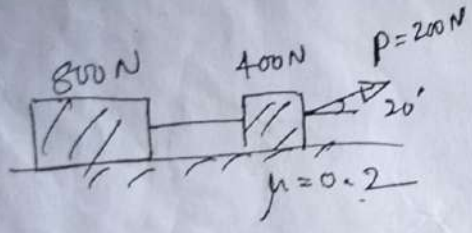

Fig.9 Q(b)

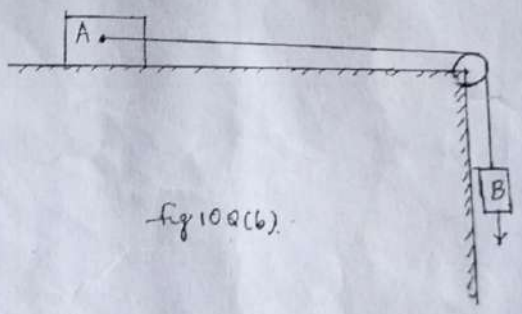

fig 10 Q(b).

10 a) Define (i) Impulse (ii) momentum and (iii) direct central impact. 6 L1

b) A block A of mass 80 kg resting on a rough horizontal plane is moved by another block B of mass 120 kg. The two are connected by a weightless string passing over a flectionless pully as shown in Fig. 10 Q (b). If μ between block A and the plane is 0.3, determine the velocity of A after it moves a distance of 1m from rest. 8 L5

c) A ball of mass 60 kg moving with a velocity of 5m/s collides directly with a stationary ball of mass 20 kg. If the two balls get stuck together after the impact, what is their common velocity? What is the loss of KE due to impact? 6 L5

BT* Bloom's Taxonomy, L* Level

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b) Write a note on angle of repose.

Make up – January 2016

c) A Block weighing 4500N resting on horizontal surface supports another block of 3000N as shown in Fig. 6(a). Find the horizontal force P required to just move the block to the left. Take the coefficient of friction for all contact surfaces as 0.3. 04 L2

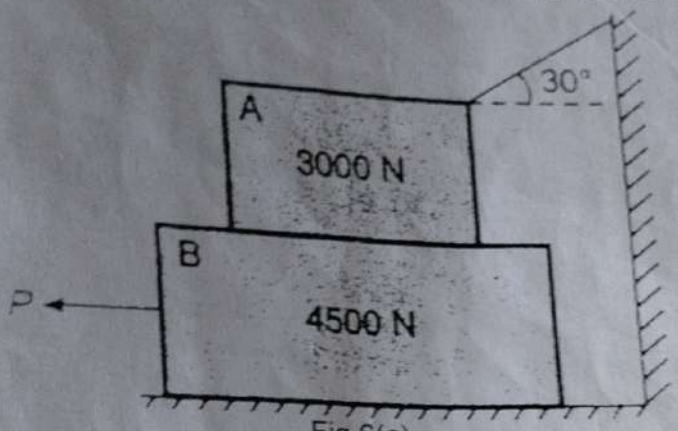

Fig.6(a) 10 L5

Unit – IV

7. a) State and prove parallel axis theorem. 06 L2

b) Define the terms with Equation & Sketch i) Polar moment of inertia ii) Radius of gyration 06 L2

c) Locate the centroid of area of the section with respect to the axis as shown in Fig.7(c) 08 L4

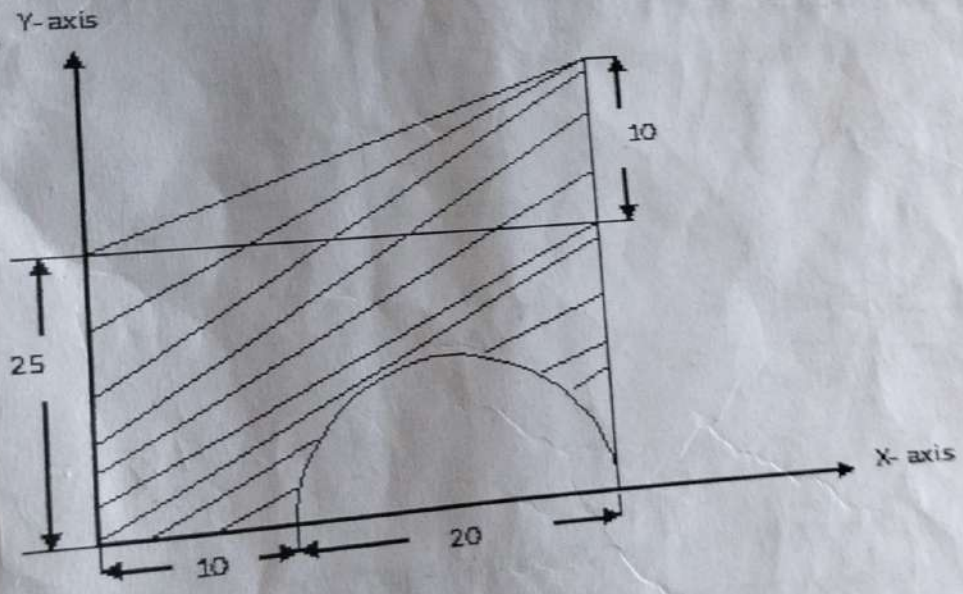

Fig no: 7(C)

Note: All dimensions are in mm

8. a) Define Centroid. Determine the Centroid of a sector of a circular area by method of Integration 08 L1 L4

b) Explain with an example the Axis of Symmetry with respect to plane figures. 02 L2

b) Replace the force acting at B by an equivalent force couple system at A as shown in Fig. Q 3 (b).

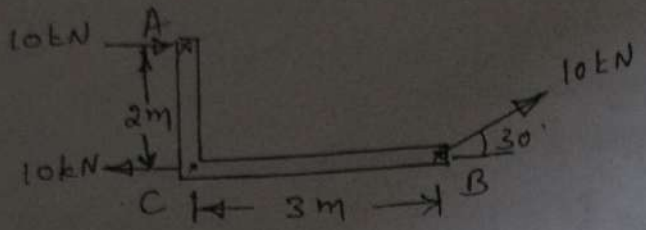

Fig Q. 3(b)

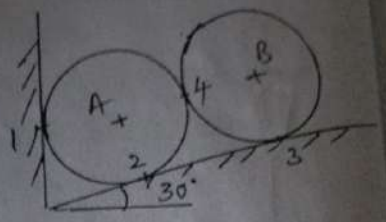

Fig. Q 3(c)

c) Determine the reactions at the contact points for the two identical cylinders placed in a trench as shown in Fig. Q 3(c). Take weight of each cylinder as 100 N.

4. a) List any 4 characteristics of a couple.

b) Determine the weight W for equilibrium of strings as shown in Fig Q 4(b).

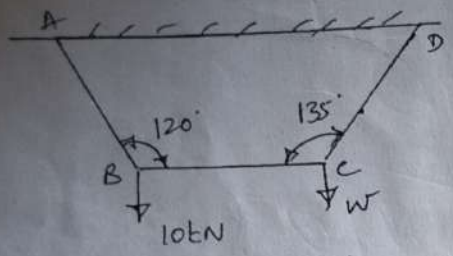

Fig. Q 4(b)

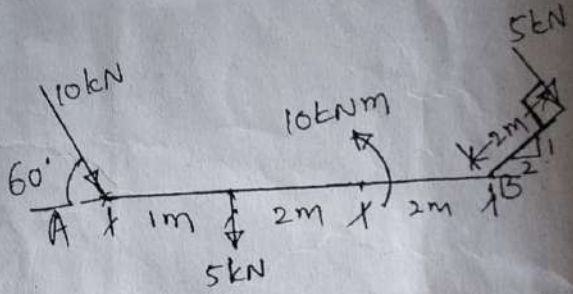

Fig. Q 4(c)

c) Determine the resultant of the force system acting as shown in Fig Q 4(C) with respect to A.

Unit – III

5. a) Write conditions of Equilibrium used in coplanar non-concurrent force system

b) Name and Explain different types of supports with neat sketch

c) For the beam with loading shown in Fig. 5(c), determine the reactions at the supports.

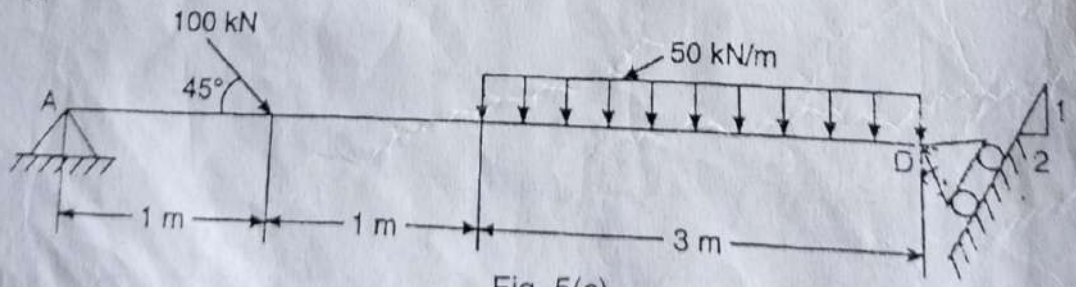

Fig. 5(c)

6. a) List Coulomb's laws of friction.

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First Semester B.E. (Credit System) Degree Examinations

Make up Examinations - January 2016

15CV103 – ELEMENTS OF CIVIL ENGINEERING AND ENGINEERING MECHANICS

Hours

Max. Marks: 100

te: 1) Answer **Five full** questions choosing **One full** question from **each Unit.**
2) Assume any missing data suitably.

Unit – I

	Marks	BT*
plain how the Infrastructure Development will help the growth of economy of ntry in i) Transportation Engineering ii) Geotechnical Engineering.	06	L*2
te and explain principle of transmissibility of forces. What are its limitations?	06	L2
termine the resultant of the force system acting at a point as shown in Q1(c).		

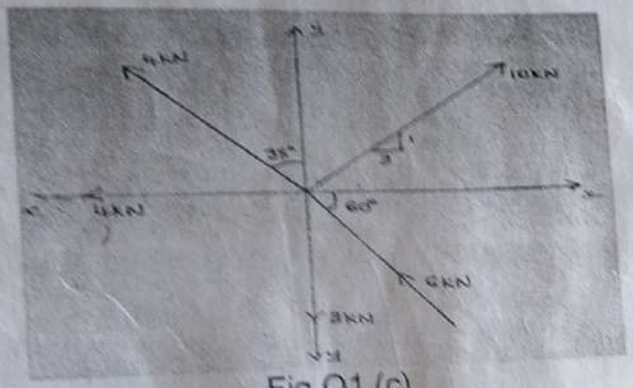

Fig.Q1 (c)

	08	L5 L3
Explain briefly i) Force and its Characteristics. ii) Rigid body concept	07	L2
Distinguish between i) mass and weight ii) resolution and composition with sketches.	06	L2

The resultant of 4 forces acting at a point "O" is 4kN vertically upwards. Compute the values of F_1 and F_2 as shown in Fig. Q2(c).

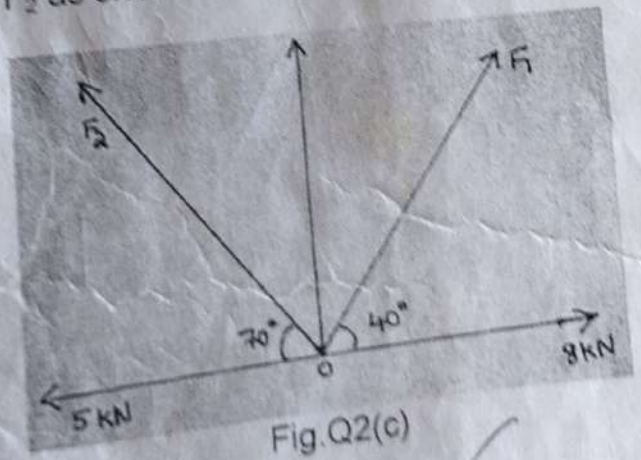

Fig.Q2(c)

07 L4

Unit – II

Moment of a force is equal to moment sum of its components. Prove this statement. 04 L4

15CV103

10. a) State and Prove impulse momentum principle. 06
b) Define direct central impact, coefficient of restitution and give equations for coefficient of restitution 06
c) Two identical spheres approach each other with velocities 3m/s and 6m/s. If the co-efficient of restitution is 0.7. Determine their velocities after impact. Also find the loss of K.E during impact. Take m=10kg. 10

BT* Bloom's Taxonomy, L* Level

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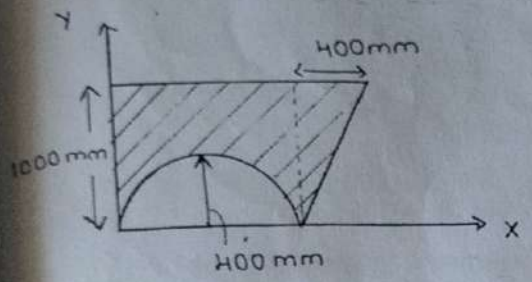
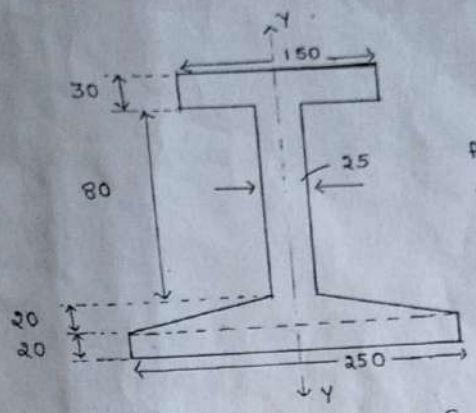
SEE – April – May 2016

Unit – IV

7. a) State and prove parallel axis theorem. 04 L1
   b) Derive an expression for the moment of inertia of rectangular section about its centroidal axes from first principles. 06 L2
   c) Locate the centroid of the shaded area about the axis shown in the fig. 7(c). 10 L4



Q. No. 7(c) Fig. 7(c)



All dimensions are in mm.

Q. No. 8(c) Fig. 8(c)

8. a) Distinguish between centroid and centre of gravity. 04 L1
   b) From first principles, determine the centroid of the triangle of base b and height h. 06 L2
   c) Determine the moment of inertia of the built up section shown in the Fig. 8(c). about its vertical centroidal axis. 10 L4

Unit – V

9. a) State and explain D'Almbert's Principle 04 L2
   b) A 12,000kN of train is accelerated at a constant rate up of 2% grade. The track resistance is 9N/kN. The Velocity increases from 9m/s to 19m/s at a distance of 600m. Determine the maximum power developed by the locomotive. Use work energy principle. 08 L5
   c) A block of mass 400kg is being pulled up the inclined plane by using another block B of mass 800kg as shown in Fig 9(c). Determine the acceleration of block B and tension in the rope pulling the block. Take coefficient of friction between block & plane as 0.2. Assume the rope as inextensible and pulleys are smooth frictionless & massless. Use D'Almbert's Principle.

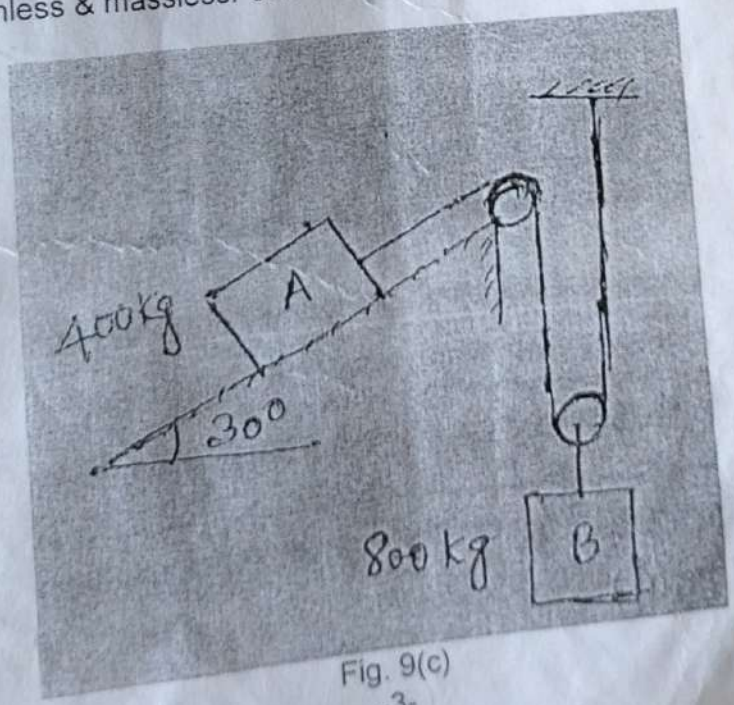


Fig. 9(c) 08 L

15CV103

4. a) Distinguish between resultant and equilibriant with example. 04
   b) Distinguish between moment and couple with example. 04
   c) A sphere weighing 100N is fitted in a right angled notch as shown in Fig. Q4(c). Determine the reactance at A and B. 06

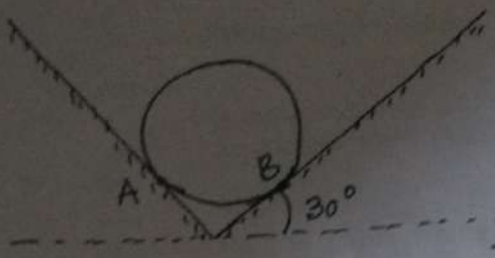


Fig Q4(c)

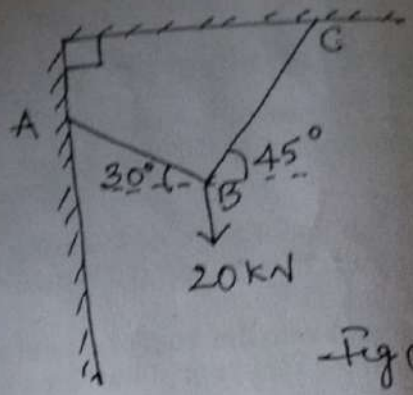


Fig Q4(d)

   d) Two cables are connected at A and C as shown in Fig. Q4(d) and a force of 20 kN is applied at B. Determine the forces in the cable along BA and CB. 08

Unit – III

5. a) Distinguish between Hinged Support and fixed support with sketches. Show the reactions at the supports. 04
   b) Determine the positions of the supports for the beam loaded as shown in Fig. 5(b) such that the reactions at the supports are equal.

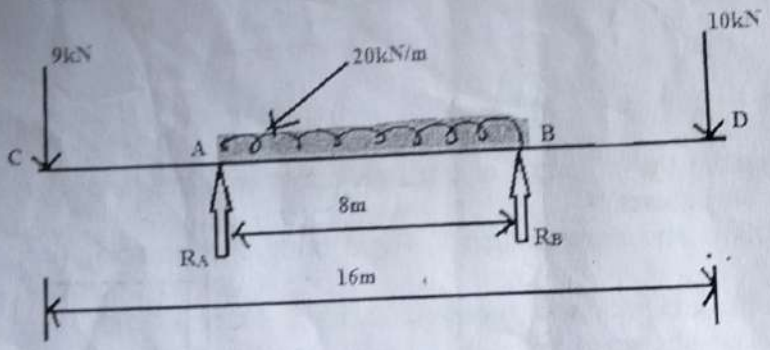


Fig. 5(b)

   c) A ladder 5m long weighing 300N is resisting against a smooth vertical wall and a rough horizontal floor making an angle θ with respect to the horizontal. When a 800N man stands at the top of the ladder, the ladder begins to slip. Determine the angle θ for which ladder does not slip. Take coefficient of friction between the ladder and the floor as 0.4. 08

6. a) State coulomb's laws of dry friction. 06
   b) Explain (i) limiting friction and (ii) kinetic friction with sketches 04
   c) Determine the reactions at supports A and B for the beam loaded as shown in Fig. 6(c).

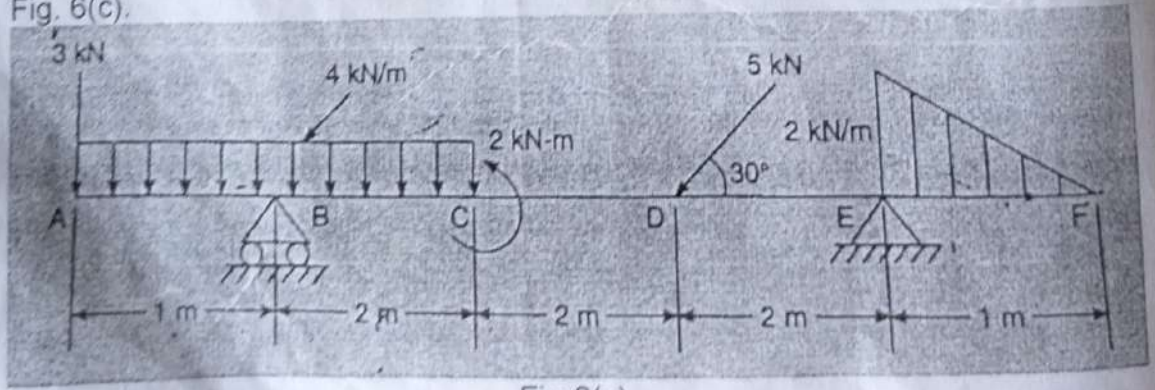


Fig.6(c) 10

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Second Semester B.E. (Credit System) Degree Examinations

April - May 2016

15CV103 – ELEMENTS OF CIVIL ENGINEERING AND ENGINEERING MECHANICS

tion: 3 Hours

Max. Marks: 100

*Note: Answer **Five full** questions choosing **One full** question from **each Unit.***

Unit – I

		Marks	BT*
a)	Explain the importance of following fields of civil engineering in the economic development of a nation i) Transportation engineering and ii) water resources engineering.	06	L*2
b)	Explain force with the help of a neat sketch.	04	L2
c)	Determine the resultant of the force system acting at O as shown in Fig. Q 1 (c).	10	L5

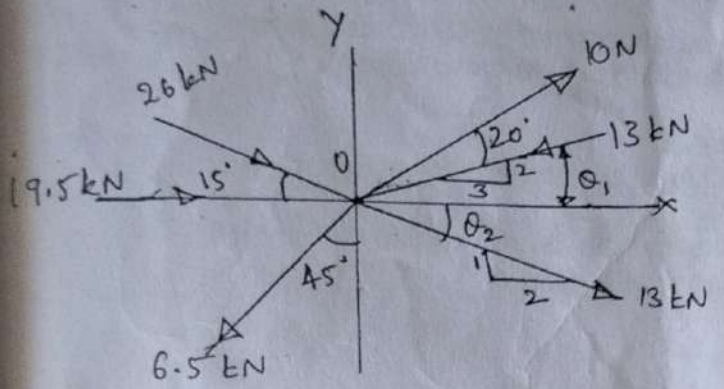

Fig. Q1(c)

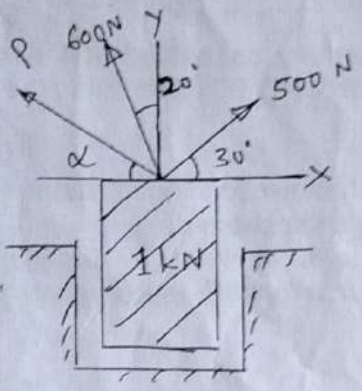

Fig. Q 2 (c)

a)	List axioms of mechanics. Explain the principle of transmissibility with the help of a neat sketch. What are its limitations?	06	L1 L2
b)	Distinguish between i) resolution and composition ii) Rigid body and particle. Give examples in each case.	06	L2
c)	Determine the force P and its inclination α required to lift a block of 1kN vertically upward from a trench as shown in Fig. Q 2 (c).	08	L5

Unit – II

a)	Define a couple. What are its characteristics?	05	L1
b)	State and prove Varignon's theorem.	05	L2
c)	Replace the force system shown in Fig.Q3(c) by a single force passing through A and moment of a couple	10	L5

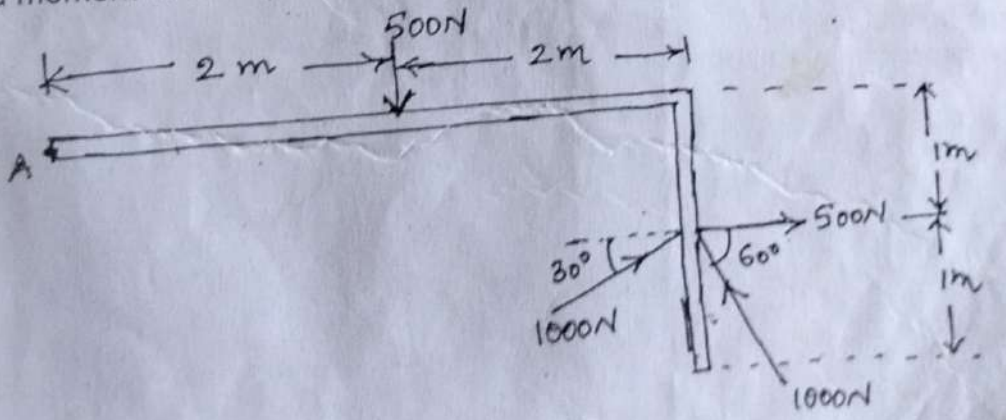

Fig Q3(c)

c) A Tennis ball is dropped Vertically from rest from a height of 15m on a horizontal floor. It rebounds to a height of 9m. The ball falls down and raises again to an unknown height. What is the height of this second rebound? 04 L5

2. a) State and explain D Alembert's principle. 06 L2

b) Distinguish between impulse and momentum. Derive the relation between impulse and momentum. 06 L2

c) Determine the horizontal Pull P in order to give a Velocity of 3 m/s to the system of bodies shown in Fig. 10Q (c) after it has moved 2m from rest. Assume $\mu = 0.2$ for all contact surfaces and that the pulleys are smooth. Use Work-energy method.

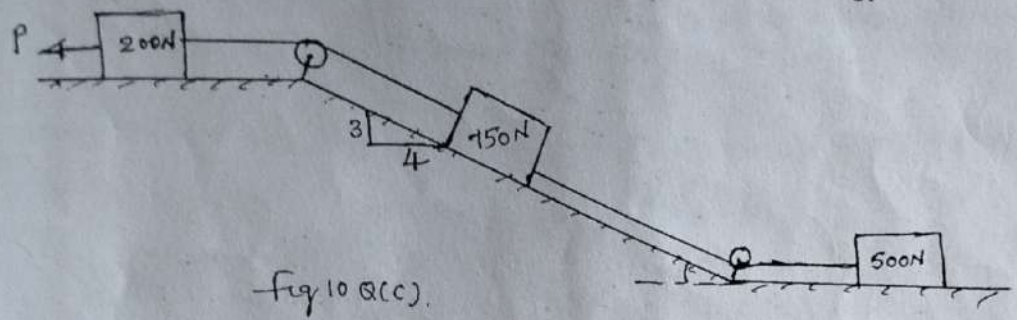

fig 10 Q(c). 08 L5

Bloom's Taxonomy, L* Level

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c) Locate the centroid of the section with respect to the axis as shown in Fig.7(c)

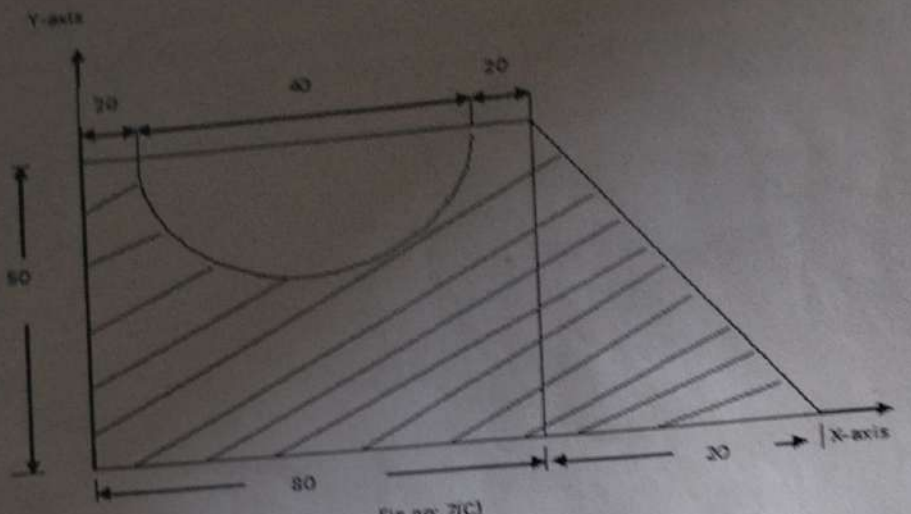


Fig no: 7(C)

Note: All dimensions are in mm

8. a) Distinguish between centroid and center of gravity. Determine the radius of gyration about the horizontal centroidal axis for a rectangular lamina of breadth 50mm and depth 100mm.

b) Determine the centroid of a quadrant of a circular area by method of Integration.

c) Determine the second moment of the area of the section with respect to AB as shown in Fig.8(c)

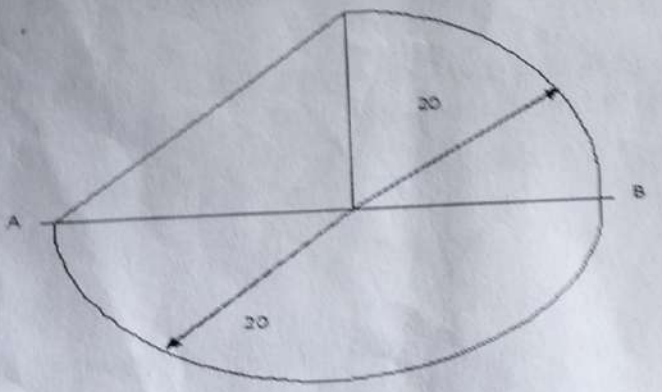


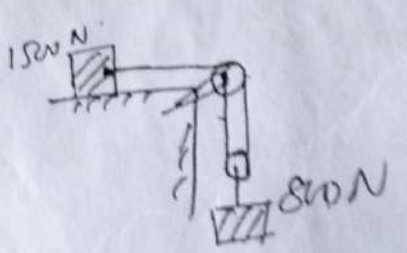
Fig no: 8(C)

Note: All dimensions are in mm

Unit – V

9. a) State and prove work energy principle.

b) Determine the acceleration and Tension in the string for the system of blocks connected as shown in Fig. 9 (b). Take $\mu = 0.2$ between the block and horizontal plane.



b) Name and explain different types of beams with neat sketches. 08 L2

c) A 4m ladder weighing 200 N is placed against a vertical wall as shown in Fig. 5(a). As a man weighing 800N reaches a point 2.7m from A, the ladder is about to slip. Assuming that the co-efficient of friction between the ladder and the wall is 0.2. Determine the co-efficient of friction between the ladder and the floor.

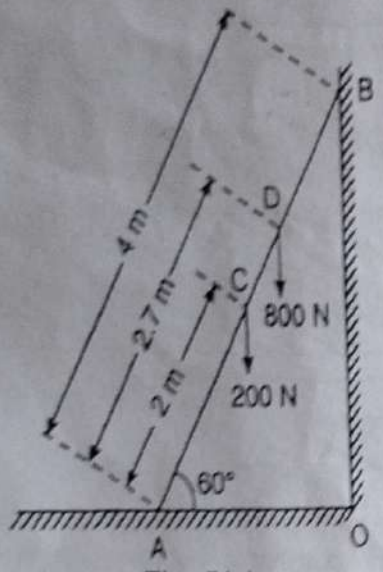


Fig. 5(a) 08 L5

a) Describe cone of friction with a neat sketch. Distinguish limiting friction and kinetic friction. 06 L1

b) What is meant by angle of repose? Show that angle of repose is equal to angle of friction. 04 L3

c) A beam ABCDEF is hinged at A, Supported on rollers at E and carries loads as shown in Fig. 6(a). Determine the reactions at the supports.

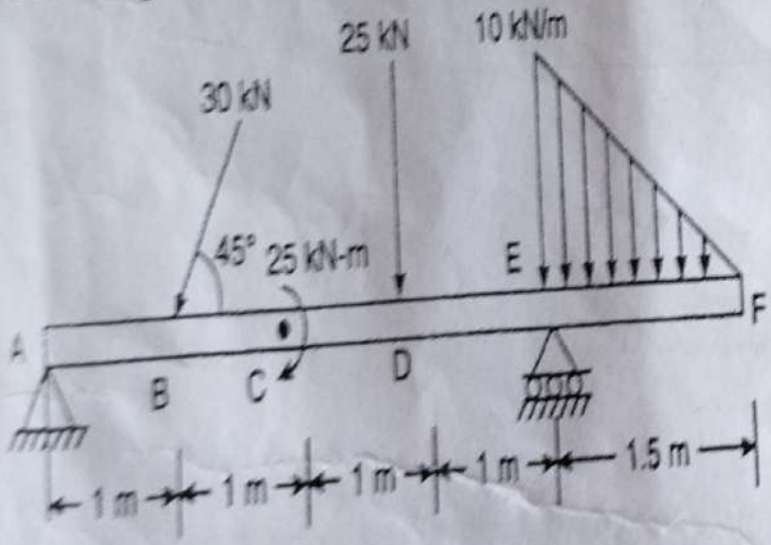


Fig. 6(a) 10 L5

Unit – IV

a) State and prove parallel axis theorem. 06 L2

b) Derive an Expression for moment of inertia of the triangular lamina about its centroidal axis. 06 L4

b) A cylinder of 300 N is being pulled by a force P and a string passing over a frictionless pulley carrying a weight of a 200 N as shown in Fig.Q3 (b). Determine the force P and inclination Θ for equilibrium of cylinder. 05 L4

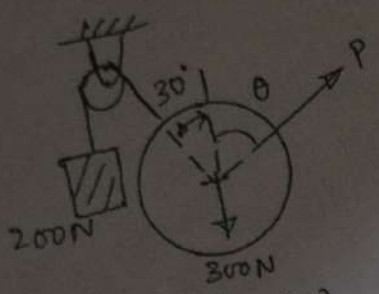


Fig. Q3(b)

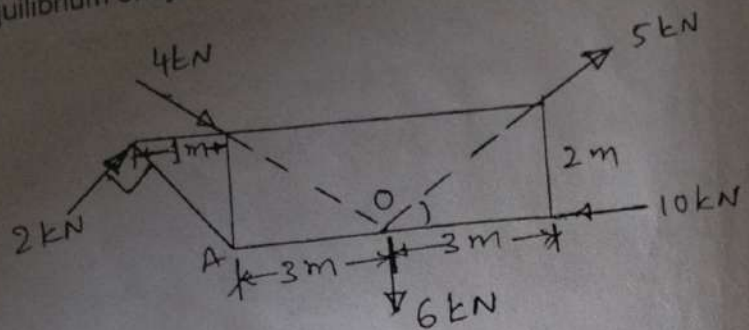


Fig. Q3(c)

c) Determine the resultant of the force system acting on the plate with respect to O as shown in Fig.Q3(c) with respect to A. 10 L5 04 L4

4. a) Prove principle of moments.

b) Replace the force acting at B as shown in Fig.Q4 (b) by an equivalent force couple system acting at A. What should be the value of Θ made by the force with the horizontal so that the moment of force about A is zero? 06 L4

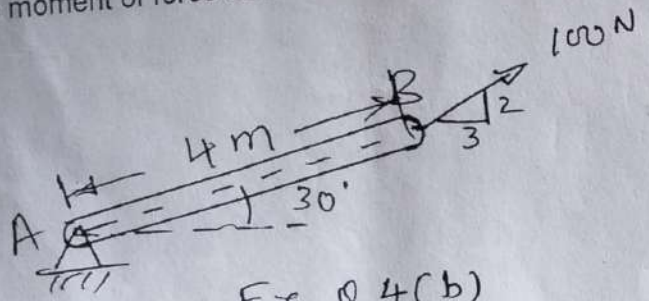


Fig. Q4(b)

c) Determine the reactions at the contact points for the system of cylinders in equilibrium as shown in Fig.Q4(c). Take W_A = 2kN and W_B =1 kN.

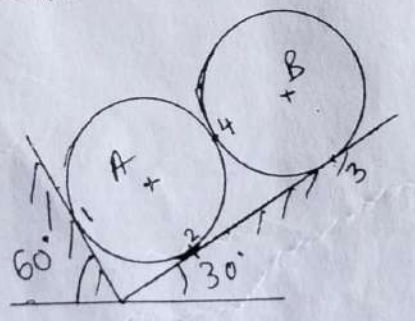


Fig. Q4(c) 10 L4

Unit – III

5. a) Write any two differences between Hinged support and Fixed support with the help of neat sketches. 04 L

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First / Second Semester B.E. (Credit System) Degree Examinations

Make up / Supplementary Examinations – July 2016

15CV103 – ELEMENTS OF CIVIL ENGINEERING AND ENGINEERING MECHANICS

Duration: 3 Hours

Max. Marks: 100

*Note: Answer **Five full** questions choosing **One full** question from **each Unit.***

Unit – I

		Marks	BT*
1. a)	Explain the scope of civil engineering in i) Surveying ii) Transportation engineering	06	L*2
b)	Explain Basic Idealization in Engineering Mechanics.	06	L2
c)	Determine the resultant for the Force system shown in Fig. Q1(c).		

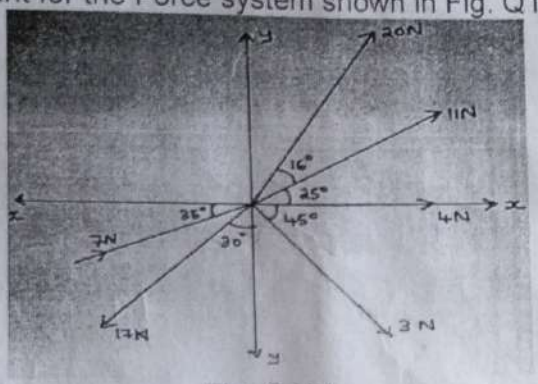

Fig. Q1(c). 08 L5

a)	Define i) Particle ii) Rigid Body	iii) Continuum iv) Force	06	L1
b)	Explain different types of force system with sketches.		06	L2
c)	Forces acting on a Gusset plate of a joint in a bridge truss is shown in Fig.Q2(c). Determine the value of P and Φ such that resultant is zero in both the directions.			

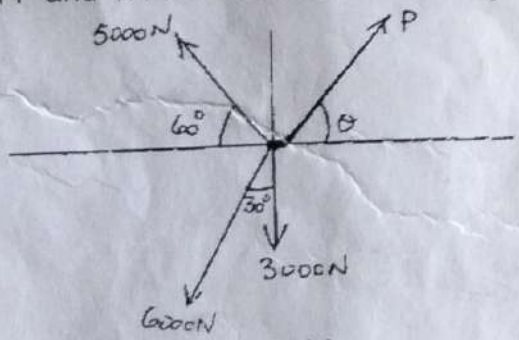

Fig. Q2(c) 08 L4

Unit – II

a)	Moment of a couple does not depend on moment center. Justify the statement. State any three characteristics of a couple.	05	L2

Unit – IV

7. a) Define (i) Centroid (ii) Center of Gravity (iii) Axis of symmetry (iv) Centroidal Axis with sketch
   b) Explain the determination of centroid by the method of moments.
   c) Determine the moment of intertia of the plane lamina, Fig. Q7(c) about X axis.

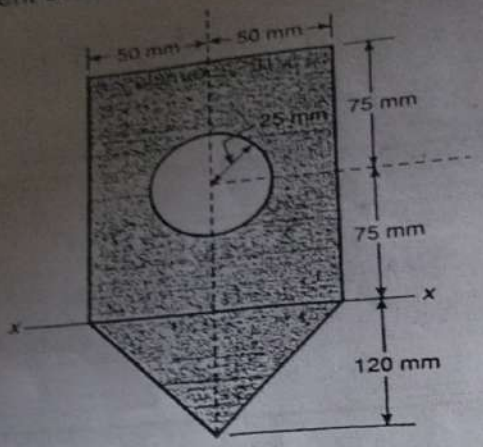

Fig. Q7(c)

8. a) State and Prove Perpendicular axis theorem
   b) Derive an expression for moment of inertia of a triangular lamina about its centroidal axis
   c) Determine the center of gravity of the lamina shown in Fig. Q8(c) with respect to O.

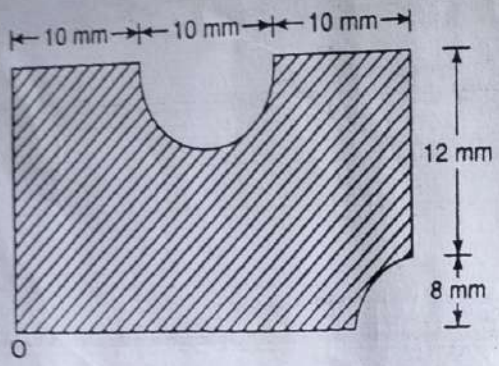

Fig.Q8(c)

Unit – V

9. a) Explain the concept of linear impulse and momentum. Derive the relationship between Impulse and momentum.
   b) A glass marble, whose weight is 0.2N, falls from height of 10m and rebounds to a height of 8m. Find the impulse and the average force between the marble and the floor, if the time during which they are in contact is 1/10 of a second.
   c) Determine the tension and acceleration of the blocks as shown in fig. Q9(c). Take coefficient of friction between the blocks and the frame as 0.2.

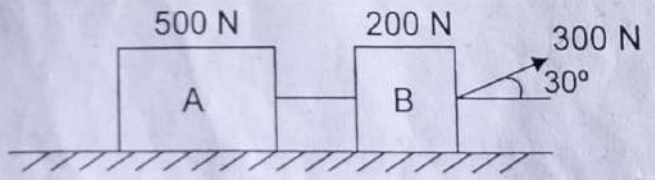

Fig. Q9 (c)

10. a) State and prove work energy principle.
    b) A man wishes to move wooden box of $1m^3$ to a distance of 5m with the least amount of work. If the block weighs 1kN and the co-efficient of friction is 0.3, find whether he should tip it or slide it.
    c) Define coefficient of restitution. Classify the bodies based on coefficient of restitution. Give the expression for determination of coefficient of restitution.

BT* Bloom's Taxonomy, L* Level

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c) Determine the reactions at the supports A and B for the beam shown in the Fig.5(c). 8 L5

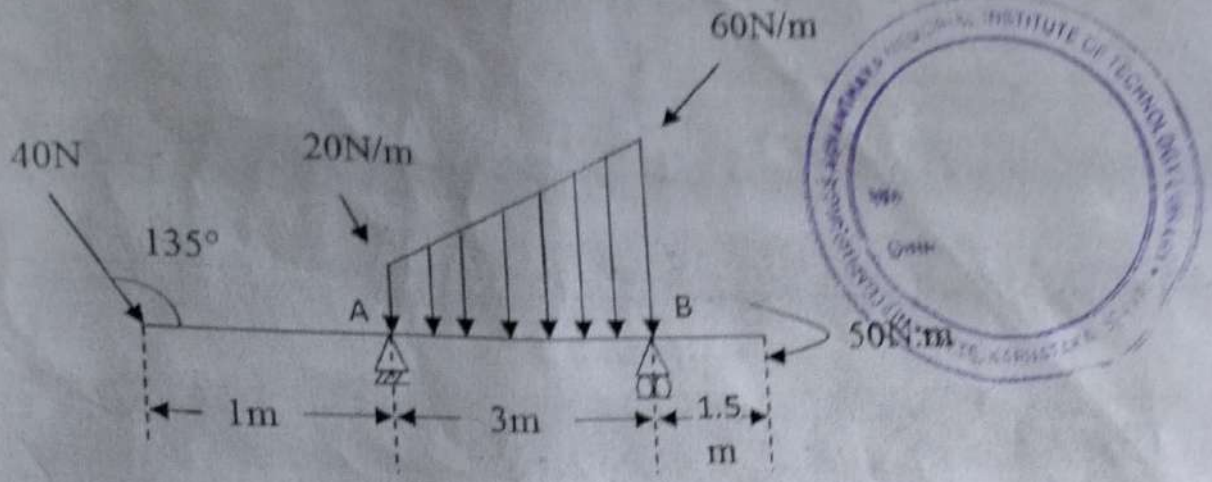

Fig.5(c)

6. a) Explain i) Angle of repose ii) Cone of friction 6 L2
b) Determine the distance x in fig.6(b) such that the reactions Ra and Rb are equal. 6 L5

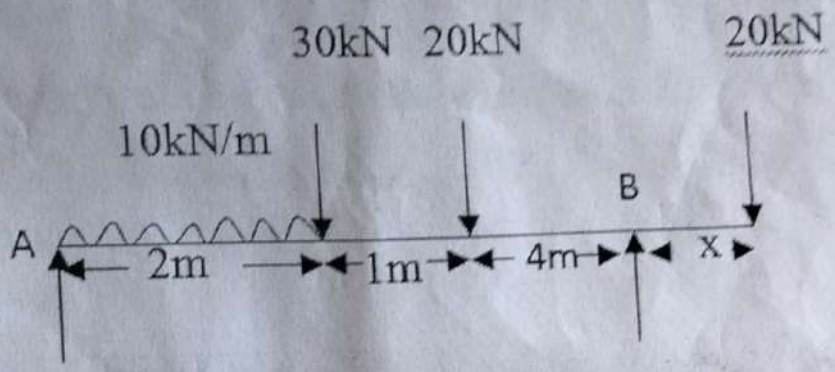

Fig.6(b)

c) What should be the value angle θ in fig.6(c) which will make the motion of 1000 N block down the plane to impend? The coefficient of friction for all the contact surfaces is 0.33. 8 L

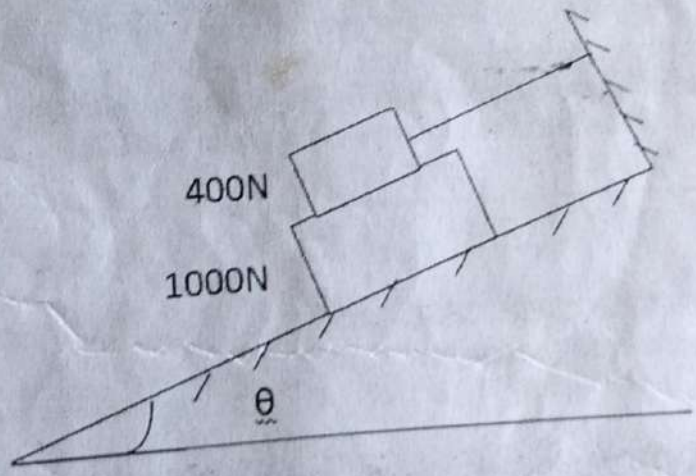

Fig.6(c)

16CV103

c) Determine the magnitude and direction of the resultant of a system of non-concurrent forces acting on the plate as shown in the fig.3(c) and locate it with respect to O.

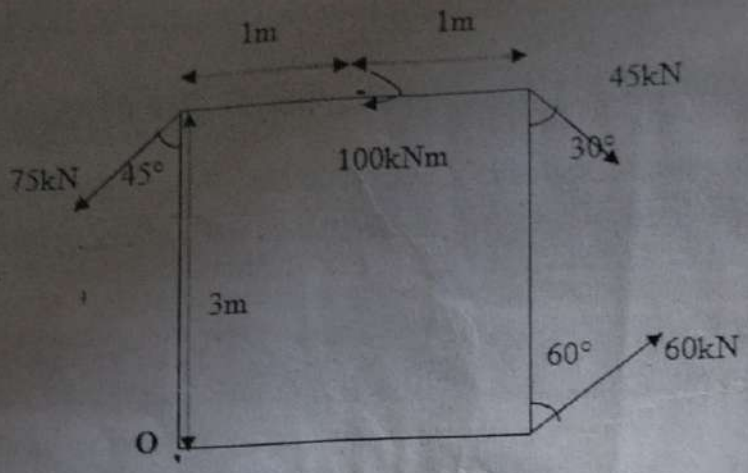

Fig.3(c)

4. a) Explain equivalent force couple system.
   b) Determine the moment of a force about A and B for the 30 N force shown in the Fig. 4(b).

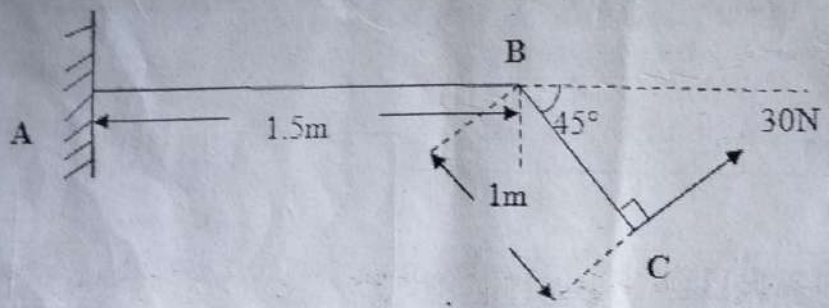

Fig.4(b)

c) Determine angle α for equilibrium of two identical cylinders placed as shown in the fig.4(c). Take weight of A = Weight of B = 1000 N.

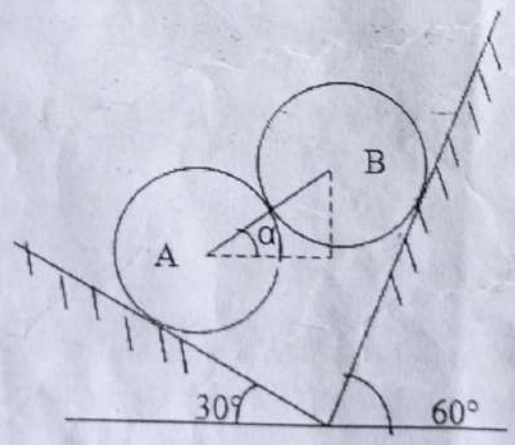

Fig.4(c)

Unit – III

5. a) Explain different types of supports and reactions with free body diagram.
   b) State Coulomb's laws of friction.

USN

NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

First Semester B.E. (Credit System) Degree Examinations

November - December 2016

16CV103 – ELEMENTS OF CIVIL ENGINEERING AND ENGINEERING MECHANICS

ation: 3 Hours Max. Marks: 100

*Note: Answer **Five full** questions choosing **One full** question from **each Unit**.*

		Marks	BT*
	Unit – I		
a)	Explain the scope of Civil Engineering in economic development of a nation considering i) Transportation Engineering, ii) Environmental Engineering.	6	L*2
b)	Define free body diagram and explain with a neat sketch.	4	L2
c)	Determine the magnitude and direction of the resultant for the force system as shown in Fig. Q 1 (c)	10	L5
2. a)	List the different types of force systems and explain any three with neat sketch.	8	L2
b)	Define force and explain the characteristics of force with neat sketch.	4	L2
c)	Determine the magnitude of unknown force and angle 'α' for a system of force acting as shown in Fig. Q 2 (c)	8	L5

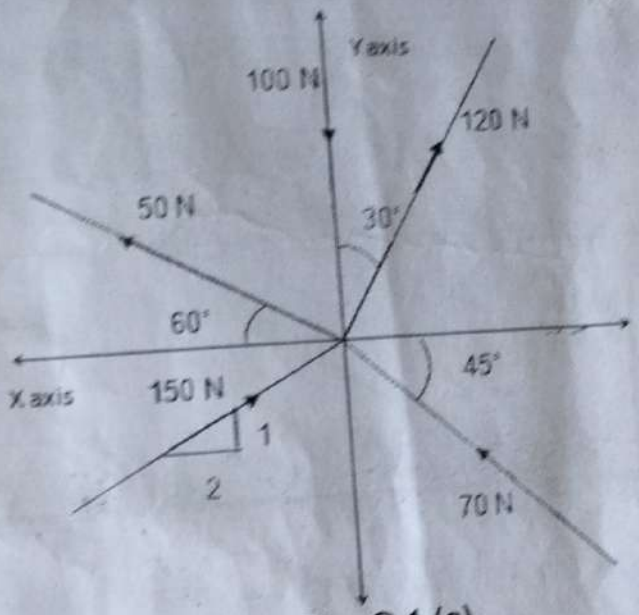

Fig. Q 1 (c)

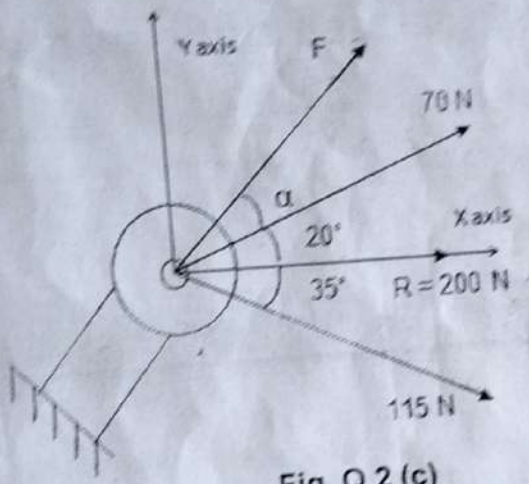

Fig. Q 2 (c)

Unit – II

3. a)	State and prove Varignon's theorem.	4	L
b)	Determine the weights W1 and W2 and tension in the strings for the system shown in the fig.3(b) such that portion BC is horizontal. Assume pulley as smooth.	6	L

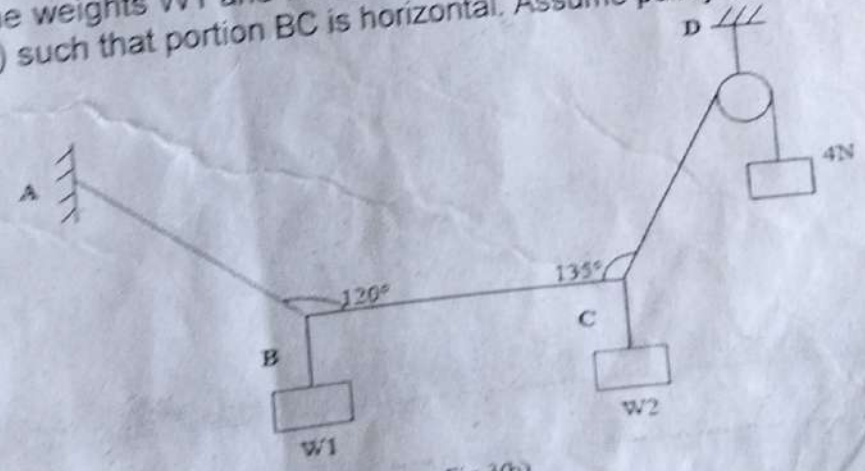

Fig.3(b)