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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

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

April – May 2018

17CV103 – 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
1	a)	Explain Resolution and composition of forces with a neat sketch.	6
	b)	Explain law of transmissibility of forces.	4
	c)	Determine the amount and direction of the smallest force P required to start the wheel in Fig. 1(c) over the block. What is the reaction at the block?	

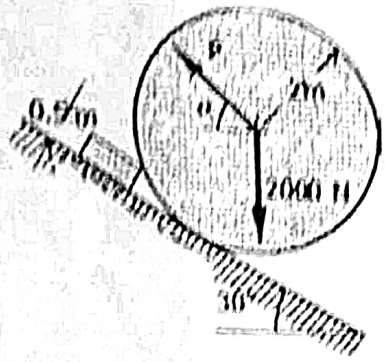

Fig. 1(c) 10

2	a)	Explain the importance of Environmental and transportation fields of civil engineering for the development of a nation.	6
	b)	Define force. Explain characteristics of force.	4
	c)	The cylinders in Fig. 2(c) have the indicated weights and dimensions. Assuming smooth contact surfaces, determine the reactions at A, B, C and D on the cylinders.	

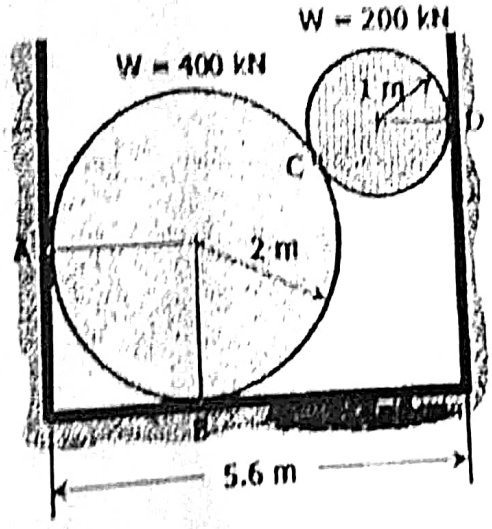

Fig. 2(c) 10

Unit – II

3	a)	State and prove Varignon's theorem.	6
	b)	Define equilibrium. State the conditions of equilibrium for coplanar non-concurrent force	4

17CV103

c) A boom AB is supported in a horizontal position by a hinge A and a cable which runs from C over a small pulley at D as shown in Fig. 3(c). Compute the tension T in the cable and the horizontal and vertical components of the reaction at A. Neglect the size of the pulley at D. If the cable pulls the boom AB into a position at which it is inclined at 30° above the horizontal. The loads remain vertical.

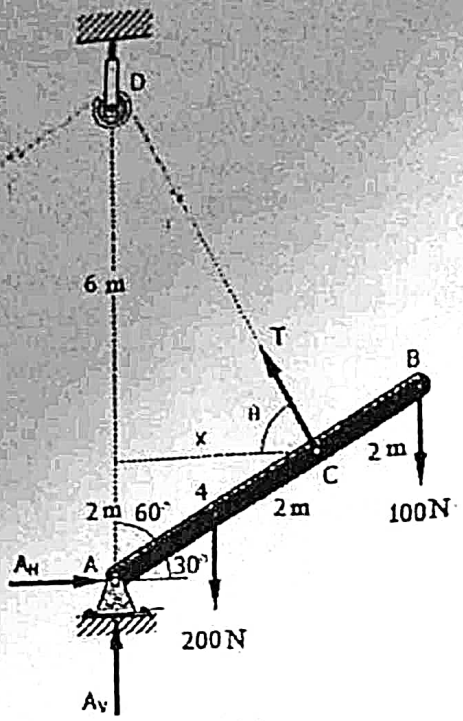

Fig. 3(c) 10

4. a) Define couple. What are the characteristics of a couple? 5
   b) Explain the resultant computation for coplanar non-concurrent force system. 5
   c) Find the reaction forces at points A, B and C necessary for the member ABC to be in equilibrium shown in Fig. 4(c).

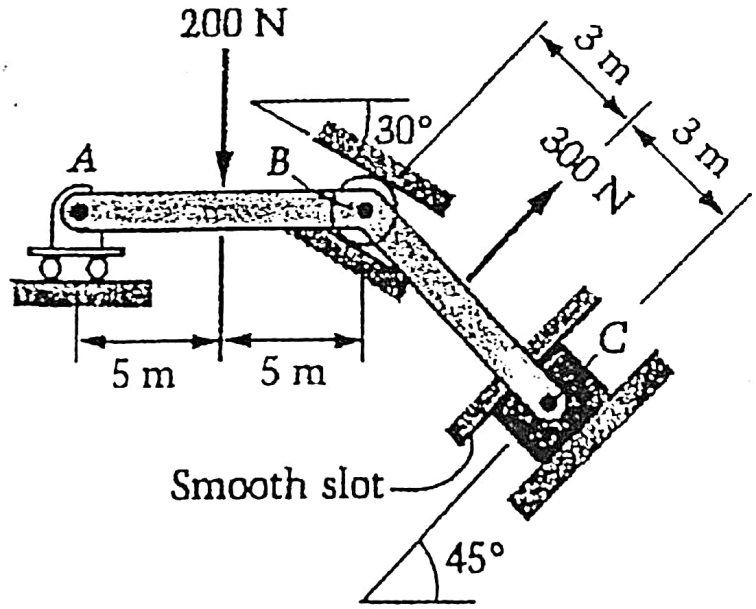

Fig. 4(c) 10

Unit – III

SEE – April – May 2018

5. a) Define friction. State any 4 laws of friction. 6
   b) Explain different supports with neat sketch and indicate reactions. 4
   c) The two 12-m beams shown in Fig. 5(c) are to be moved horizontally with respect to each other and load P shifted to a new position on CD so that all three reactions are equal. How far apart will R_2 and R_3 then be? How far will P be from D?

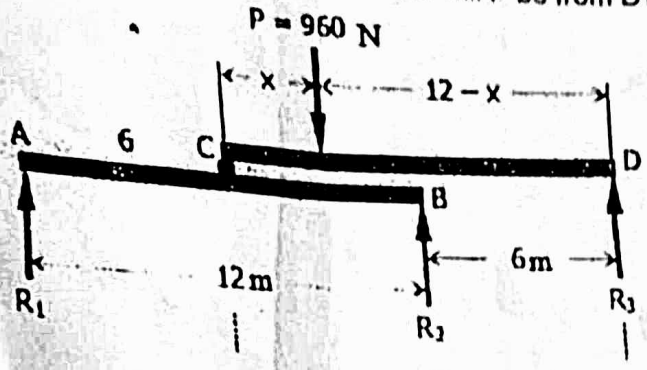

Fig. 5(c) 10

6. a) Define i) Limiting friction ii) Angle of friction and iii) Angle of repose 6
   b) Distinguish between statically determinate and indeterminate beams with an example. 4
   c) What is the value of P in the system shown in Fig. 6(c) to cause the motion to impend? Assume the pulley is smooth and the coefficient of friction between the other contact surface as 0.2.

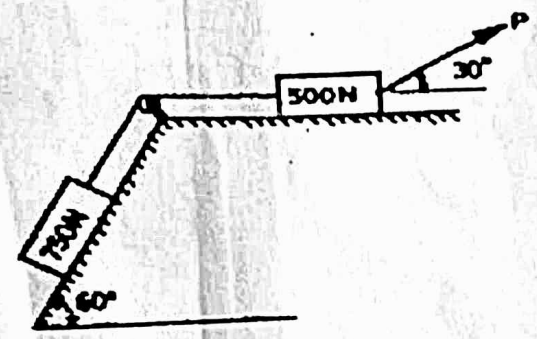

Fig. 6(c) 10

Unit – IV

7. a) Derive an expression for centroid of a semi-circular section about its diameter. 6
   b) State and prove parallel axis theorem. 4
   c) A semi-circular area is removed from a trapezium as shown in Fig.7 (c) (dimensions in mm). Determine the centroid of the remaining area (shown hatched). List the ones shown.

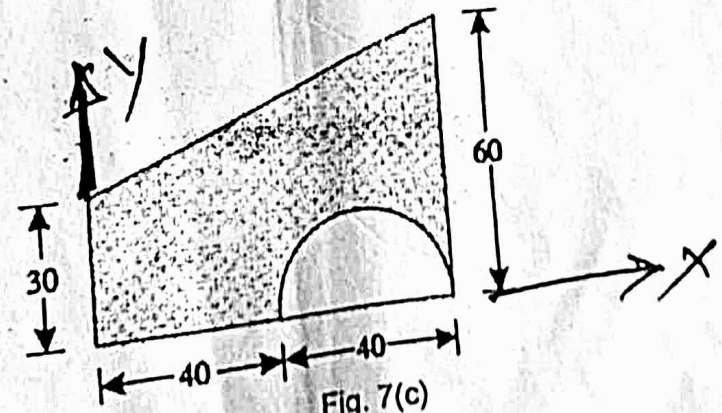

Fig. 7(c) 10

8. a) Derive an expression for moment of inertia of a triangle about its centroidal axes from first principle. 6
   b) State and prove perpendicular axis theorem. 4
   c) Find the second moment of the area as shown in Fig. 8(c) about centroid axes. 10

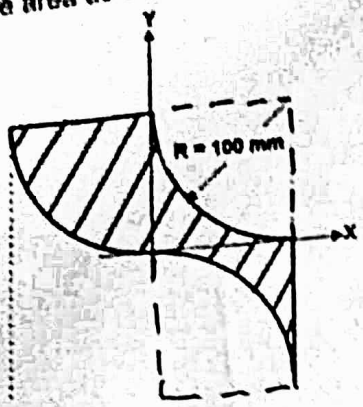

Fig. 8(c)

Unit – V

9. a) State and explain D'Alemberts principle. 6
   b) State and prove an expression for work energy principle. 6
   c) The system shown in Fig. 9(c) has a rightward velocity of 4m/s just before the force P is applied. Determine the value of P that will give a leftward velocity of 6 m/s in the time interval of 20sec. Take co-efficient of friction is 0.2, and assume ideal pulley. 8

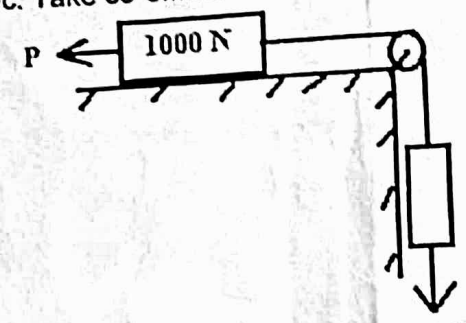

Fig. 9(c)

10. a) Define i) work ii) Power iii) Energy 6
    b) Explain impulse momentum principle. 6
    c) Determine the tension in the string and acceleration of the blocks A and B weighing 1500 N and 500 N connected by an inextensible string shown in Fig. 10(c). Assume pulley as frictionless and weightless.

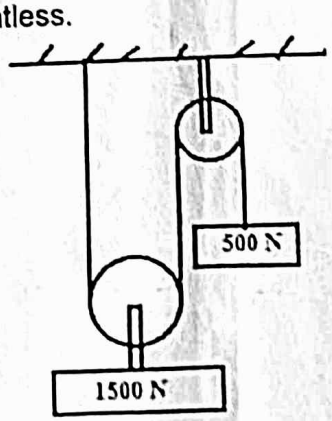

Fig. 10(c)

BT* Bloom's Taxonomy, L* Level

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

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

Make up/Supplementary Examinations - July 2018

17CV103 – 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)	Briefly explain the scope of (i) Structural Engineering (ii) Geotechnical Engg.	6	L*2
	b)	Define force. Write the unit and explain the elements of force.	6	L1
	c)	Determine the Resultant force acting on the structure shown in Fig. Q 1 (c) acting at point "o" both in magnitude and direction.	8	L5

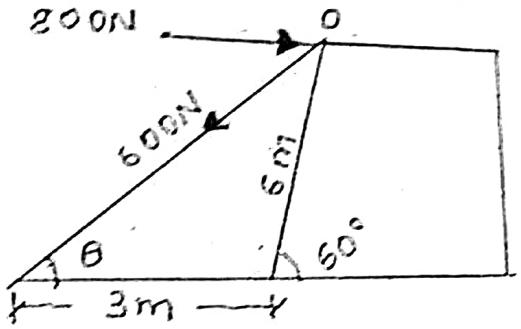

Fig. Q 1 (c)

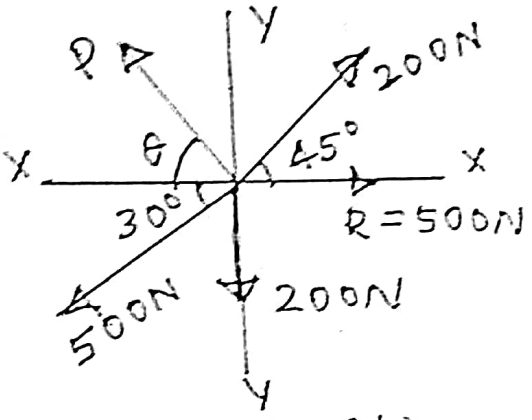

Fig Q 2 (b)

2.	a)	Briefly explain the concept of resolution and composition of forces with sketches.	8	L2
	b)	Four coplanar forces acting at a point are shown in Fig. Q 2 (b). One of the forces is unknown and its magnitude is shown by (p). The resultant has a magnitude of 500N and is acting along x-axis. Determine the unknown force and its inclination with x-axis.	12	L5

Unit – II

3.	a)	Explain (i) Moment of a force (ii) couple (iii) characteristics of couple (iv) Equivalent force couple system.	8	L2
	b)	Determine the magnitude and direction of the resultant force for the force system shown in Fig. Q 3(b). Locate the Resultant force with respect to point D.	12	L5

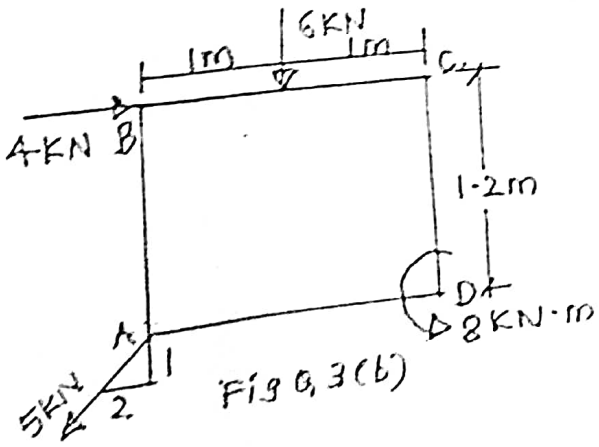

Fig Q 3 (b)

4. a) How do you differentiate between Equilibrium and Equilibrant? 4 L1
   b) State and prove varignon's theorem of moments. 8 L1
   c) Two spheres each of weight 1000N and of radii 25cm rests in a horizontal channel of width 90cm as shown in Fig. Q4(c). Find the reactions at the contact points A,B,C and D.

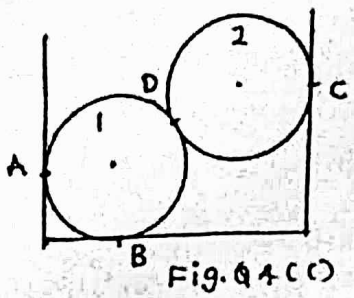

Fig. Q4 (c) 8 L1

Unit – III

5. a) Explain different types of beams with sketches. 6 L2
   b) A simply supported beam of Length 5m is loaded as shown in Fig. Q5(b). Find support reactions.

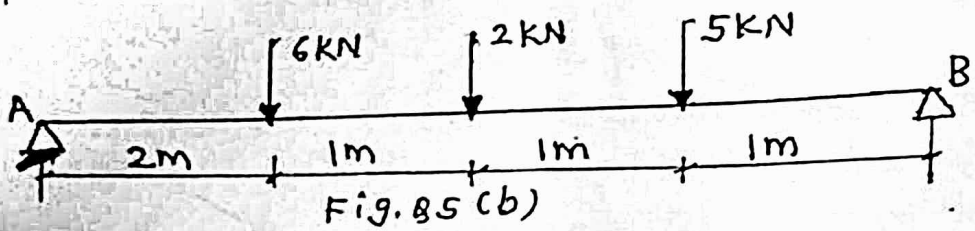

Fig. Q5 (b) 4 L1

   c) Determine the reactions at A and E for the beam shown in Fig. Q5(c).

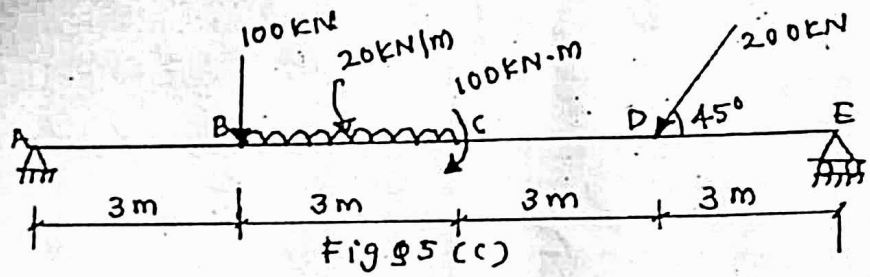

Fig Q5 (c) 10 L5

6. a) Prove that angle of friction is equal to angle of repose. 6 L5
   b) State the laws of Dry Friction. 4 L1
   c) A ladder of 5m long rests on a horizontal ground and leans against a smooth wall at an angle of 70^0 with the horizontal as shown in Fig. Q 6 (c). The weight of ladder is 900N and a man weighing 750 N stands on the ladder at a distance of 1.5m from the bottom of ladder. Calculate the coefficient of friction between the ladder and ground.

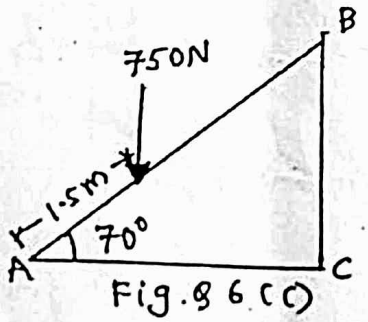

Fig. Q 6 (c)

Unit – IV 10 L3

7. a) State and prove parallel axis theorem. 6 L1

b) Derive an expression for moment of inertia of a triangular section about centroidal x-axis. 4 L4

c) Determine the centroid of Fig. Q 7 (c) shown.

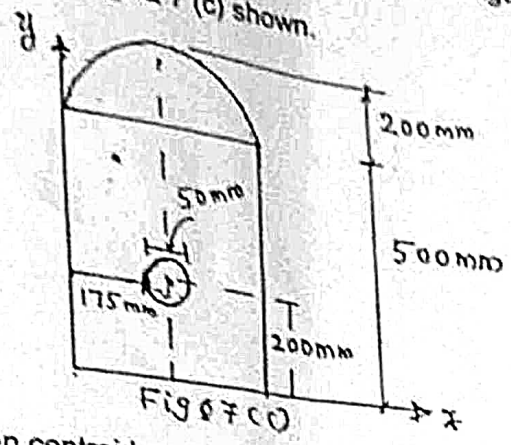

Fig Q7 (c)

8. a) Distinguish between centroid and centre of gravity. 10 L5

b) Derive an expression for the centroid of a semicircular area about centroidal X axis and Y axis. 4 L1

c) Determine the moment of Inertia of Fig. Q 8(c) shown about centroidal X and Y axis. 6 L5

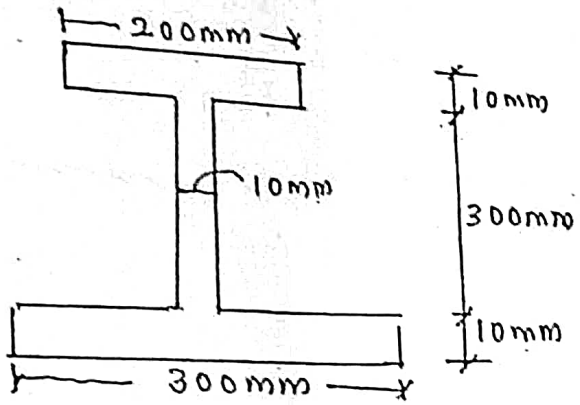

Fig Q8 (c) 10 L5

Unit – V

9. a) Explain (i) Impulse (ii) Momentum (iii) Direct central Impact. 6 L2

b) State and Explain D' Alembert's principle. 6 L1

c) A Lift has an upward acceleration of 1m/sec^2. What pressure will a man weighing 640 N will exert on the floor of lift? What pressure would be if the lift had an acceleration of 2m/sec^2 downward? 8 L2 6 L1

10. a) Define (i) work (ii) Power (iii) Energy 6 L4

b) Derive an expression for work energy relations.

c) Ball A of mass 1 kg moving with a velocity of 2m/sec impinges directly on a ball B of mass 2 kg at rest. Find the velocities of two balls after impact. 8 L3

Assume e= $\frac{1}{2}$

BT: Bloom's Taxonomy, L* Level

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

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

November – December 2018

18CV103 – ENGINEERING MECHANICS

Duration: 3 Hours

Max. Marks: 100

Note: *1) Answer **Five full** questions choosing **Two full** questions from **Unit – I and Unit – II** **each** and **One full** question from **Unit – III.***

2) Assume missing data suitably

Unit – I

		Marks	BT*	CO*	PO*
a)	Explain the scope and importance of Geotechnical Engineering and Water Resources and Irrigation Engineering.	06	L*1	1	1
b)	Explain Equivalent force couple system with an example	04	L2	1	1
c)	The four coplanar forces acting at a point are as shown in **figure 1c.** One of the force is unknown and its magnitude is as shown by F. The resultant is 500N and is along x-axis. Determine the force F and its inclination '0' with x-axis.				

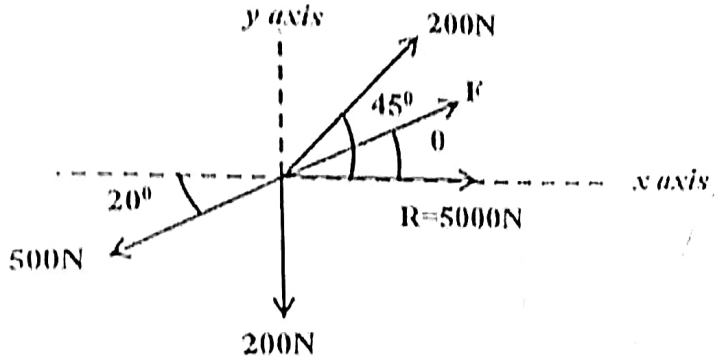

Figure 1c.

		10	L3	2	2
a)	Explain six system of forces with examples.	06	L2	1	1
b)	Define couple and mention its four characteristics.	04	L1	1	1
c)	Two smooth spheres each of radius 100mm and weighing 100N, rest in a horizontal channel having vertical walls, the distance between which is 360mm. Find the reactions at the points of contact A,B,C and D as shown in figure 2c.				

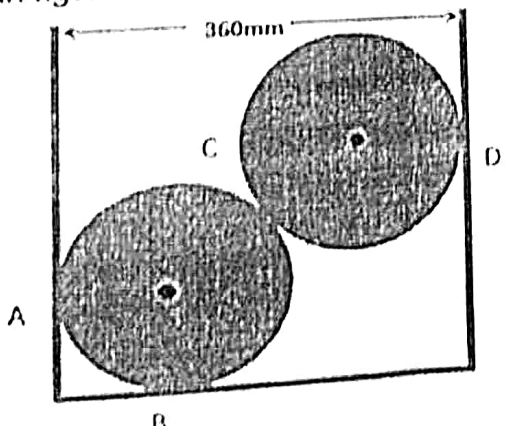

Figure 2C

10 L3 2 2

3. a) State and prove principle of moments. 06 L2 2
   b) Distinguish between Resultant and equilibrant with a neat sketch. 04 L1 1
   c) Determine the magnitude, direction and the point of application of the resultant of the coplanar non-concurrent force system shown in figure 3C with respect to point A.

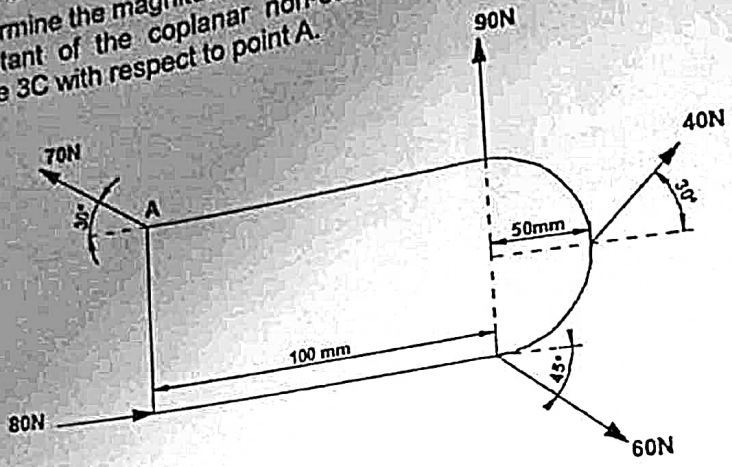

Figure 3C

10 L3 2

Unit – II

4. a) Explain types of supports and reactions developed at those supports. 06 L1 3
   b) Derive Moment of inertia of Quadrant of a circular area from first principles. 04 L2 4
   c) Find the reactions developed at supports A and B of the loaded beam shown in figure 4C.

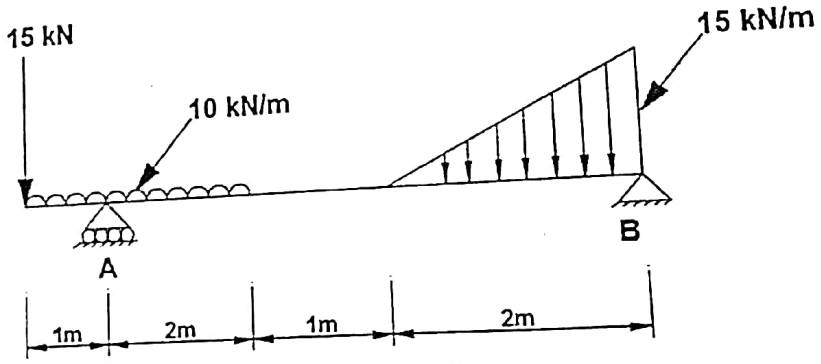

Figure 4C.

10 L3

5. a) Derive an expression for centroid of a semicircular area using method of integration about its diametral axis. 06 L2
   b) Define Polar moment of inertia and Radius of gyration. 04 L1

c) Locate the centroid of the shaded area shown in figure 5C with respect to axis AB & Find moment of inertia about the horizontal centroidal axis . All dimensions are in mm.

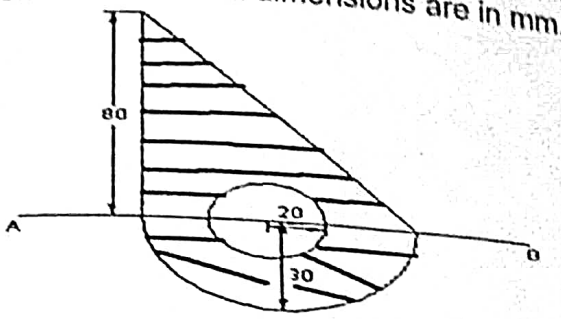

Figure 5C

a)	State and prove Parallel axis theorem	10	L4	4	2
b)	Derive Moment of inertia of right angle triangle using first principle	06	L2	4	2
c)	Calculate the centroid of the built up section shown in figure 6C. All dimensions are in mm.	04	L1	4	2

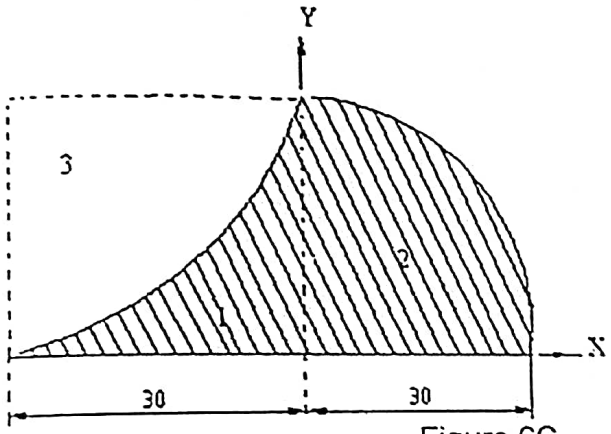

Figure 6C

		10	L3	4	2

Unit – III

a)	What is Friction, list the Laws of dry friction (any 4)	06	L1	5	1
b)	Derive an expression for Super elevation	04	L2	5	2
c)	Determine the velocity of system of blocks connected by means of a string passing over a frictionless pulley as shown in figure 7C. If the 1500N block moves up, starting from rest and covers a distance of 1m. Take coefficient of friction as 0.2 between the block and plane.				

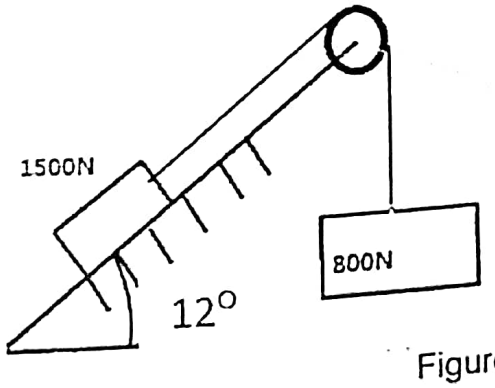

Figure 7C

		10	L3	5	2
a)	Define the terms Limiting friction, Angle of friction, angle of repose with example	06	L1	5	1

b) Explain impulse momentum principle. 04 L2 5

c) Determine velocity of blocks, if block B comes down by 2m starting from rest as shown in figure 8C.

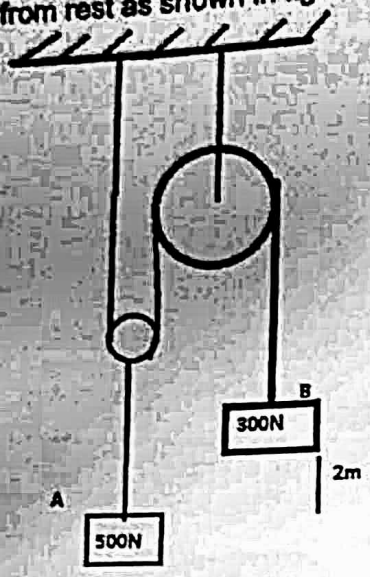

Figure 8C 10 L3 5 2

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

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