14CV103

Make up – January 2015

) Determine the centroid of the section remaining after removing a triangular area of base b and height b from the area of a square of side b as shown in Fig. 8(a). 06

) Distinguish between centroid and moment of inertia. What is the practical significance of determining these values? 04

) Determine moment of inertia of the section as shown in Fig. 7(c) with respect to vertical centroidal axis. 10

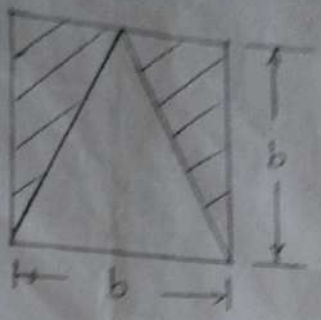

Fig. 8(a)

Unit – V

a) Define i) effective force on a particle ii) inertia force and iii)dynamic equilibrium 06

b) A tram car weighs 120 kN, the tractive resistance on the level being 5 N/kN. What power will be required to propel the car at a uniform speed of 20 kmph i) on a level surface, ii) up an inclination of 1 in 300; iii) down an inclination of 1 in 300? Take the efficiency of motor as 80%. 10

c) A ball is dropped from a height of 1 m on a smooth floor. If the height of first bounce is 810 mm. Determine i) coefficient of restitution and ii) expected height of second bounce. 04

a) Justify the use of work-energy principle and impulse-momentum principle in dynamics. Also state these principles. 06

b) A 10,000 kN train is accelerated at a constant rate up a 2% grade. The track resistance is constant at 10 N/kN. The velocity increases from 10 m/s to 20 m/s, in a distance of 600m. Determine the maximum power developed by the locomotive. 08

c) A sphere of mass 2.5 kg moving at 4 m/s towards right, strikes another sphere of mass 5 kg also moving towards right in the same line at 0.8 m/s. Find velocity of each sphere after impact. Take coefficient of restitution, e = 0.8 06

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14CV103

4. a) Explain equivalent force couple system. 04
   b) State and prove varignon's theorem. 06
   c) Two identical cylinders, each weighing 500N is placed in a trough as shown in figQ4(c), assume all points of contact are smooth. Find the reactions at contact points. 10

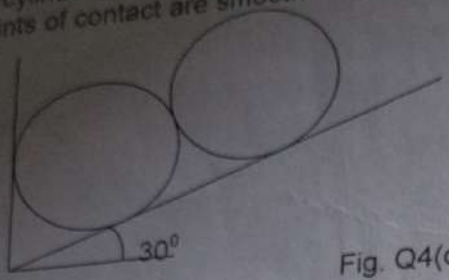
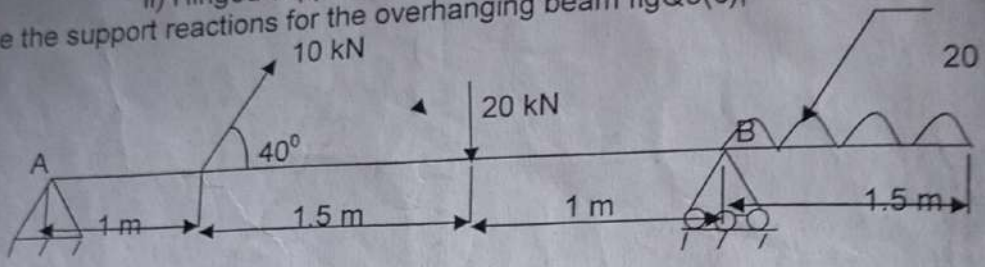


Fig. Q4(c).

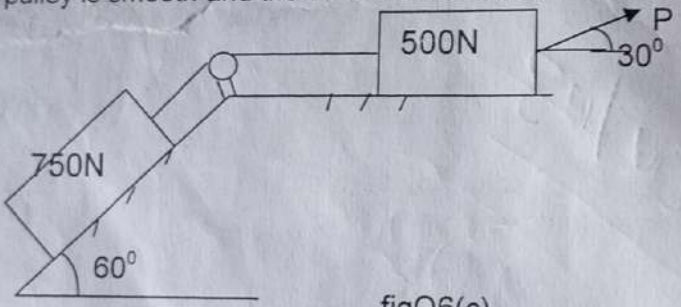
Unit – III

5. a) Mention laws of static friction. 05
   b) Distinguish between i) Statically determinate and indeterminate beams. 05
      ii) Hinged support and roller support.
   c) Determine the support reactions for the overhanging beam figQ5(c), 10



figQ5(c).

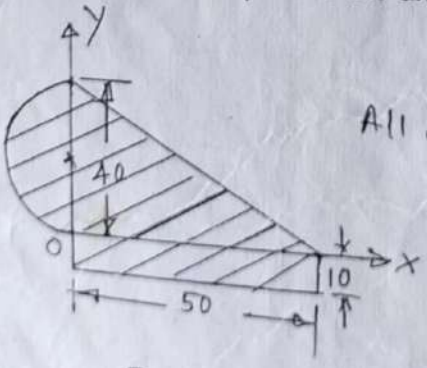
6. a) Explain different types of beams. 06
   b) Show that angle of friction is equal to angle of repose. 04
   c) What is the value of P in the system shown in figQ6(c), to cause the motion to impend? Assume the pulley is smooth and the coefficient of friction between the contact surfaces is 0.2. 10



figQ6(c),

Unit – IV

7. a) Moment of inertia of a triangular lamina about its horizontal centroidal axis is given by $bh^3/36$. Obtain this expression by method of integration. 06
   b) Find the radius of gyration for a rectangular lamina of breadth 30 mm and depth 60 mm 04
   c) Locate the centroid of the section with respect to the axes as shown in Fig. 7(c). 10



All dimensions are in mm

Fig. 7 (c)

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

Make up Examinations - January 2015

14CV103 – 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

1. a) Explain the importance of following fields of civil engineering in the economic development of a nation i) Geotechnical engineering ii) Structural engineering 06
   b) Distinguish between i) mass and weight ii) basic idealization and axioms of mechanics 06
   c) Replace the following force system acting at a point as shown in Fig. 1(c) by a single equivalent force. Determine its magnitude and direction 08

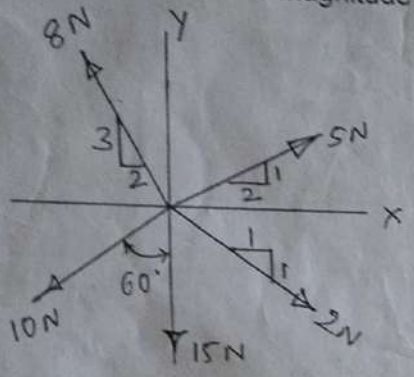

Fig. 1(c)

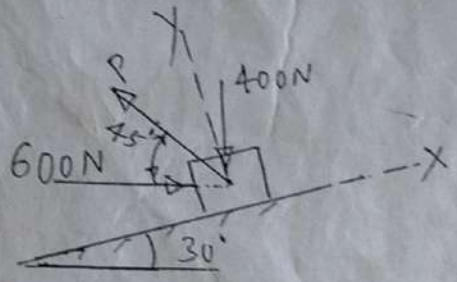

Fig. 2(c)

2. a) Explain with examples the different types of coplanar force system. 06
   b) Distinguish between i) resolution and composition ii) equilibrium law and law of action and reaction 06
   c) The block kept on the incline subjected to the forces is as shown in Fig.2(c). Determine the force P such that the resultant acts parallel to the plane. What is the magnitude and direction of the resultant? 08

Unit – II

3. a) Define couple, mention its characteristics. 04
   b) State the equilibrium condition for
   i) A system of coplanar concurrent forces. ii) A system of coplanar non-concurrent forces. 04
   c) The coplanar forces are acting on a lamina as shown in Fig. Q3(c), where the sides of each square is 1 m. Find the magnitude, direction and position of resultant w.r.t 'A'. 12

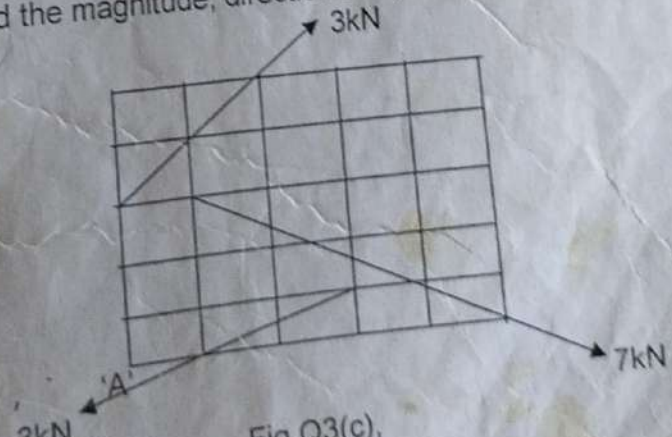

Fig.Q3(c).

14CV103

8. a) Determine the centroid of quarter circular area from first principles. 05
b) Locate the centroid of rectangle by the use of symmetry. 03
c) Define polar moment of inertia with sketch. 02
d) A semicircular cut is made in a rectangular wooden beam as shown in Fig.Q8 (d). Determine the polar moment of inertia of the section about the centroidal axis.

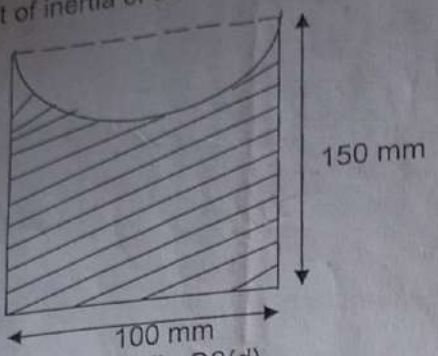

Fig.Q8(d) 10

Unit – V

9. a) State and prove work energy principle 06
b) Determine the force P required to move a block of 1 kN weight with an acceleration of 2 m / s^2 towards right as shown in Fig.9(b). Take coefficient of friction as 0.2. 06
c) A sphere of mass 2 kg moving at 4 m/s towards right, strikes another sphere of mass 5 kg moving towards left in the same line at 2 m/s. Find velocity of each sphere after impact. Also find loss of kinetic energy during impact. Take coefficient of restitution, e = 0.8 08

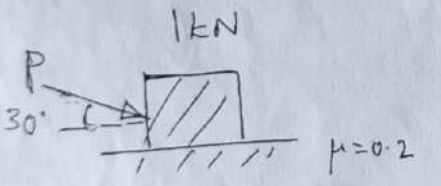

Fig. 9(b)

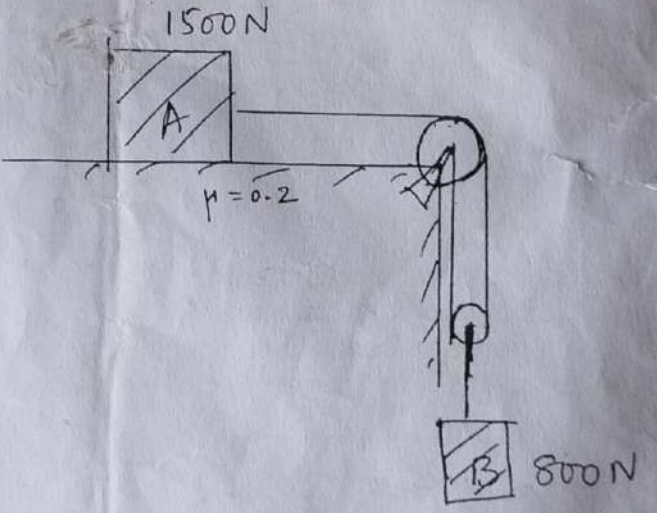

Fig. 10 (c)

10. a) State and explain D'Alembert's principle.
b) A 1500 N block resting on a horizontal plane whose kinetic friction is equal to 0.1 is subjected to a horizontal force of 300 N. What distance will it cover before the block reaching a velocity of 10 m/s after starting from rest? If 300 N force is then removed, how much farther will the block continue to move? Use work- energy principle.
c) Determine the velocity of blocks and tension in the strings for the system of blocks connected as shown in Fig.10(c) after moving for 5 seconds starting from rest using impulse- momentum principle. Take coefficient of friction as 0.2 between A and the horizontal plane.

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c) Determine the minimum force P and its direction θ required to start motion blocks to impend for the system of blocks connected as shown in Fig. 5(c). Take coefficient of friction between A and B as 0.2 and that between B and the plane as 0.3. Take weight of A =200N and weight of B =400 N 10

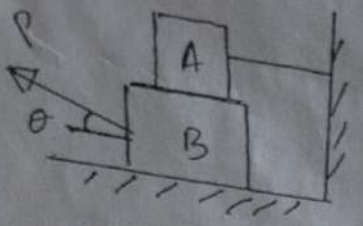


Fig. 5(c)

a) Define i) limiting friction and ii) kinetic friction 04

b) A ladder 5 m long weighing 250 N is resting against a smooth vertical wall and a rough horizontal floor making an angle 0f 65° with respect to the horizontal. When a 750 N man stands at the top of the ladder, the ladder begins to slip. Determine the coefficient of friction between the ladder and the floor such that the ladder does not slip. 06

c) Determine the reactions at supports A and B for the beam loaded as shown in Fig. 6(c). 10

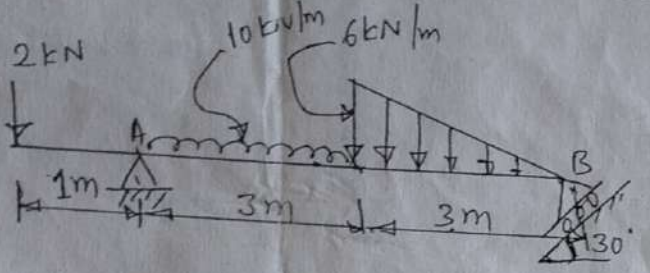


Fig. 6(c)

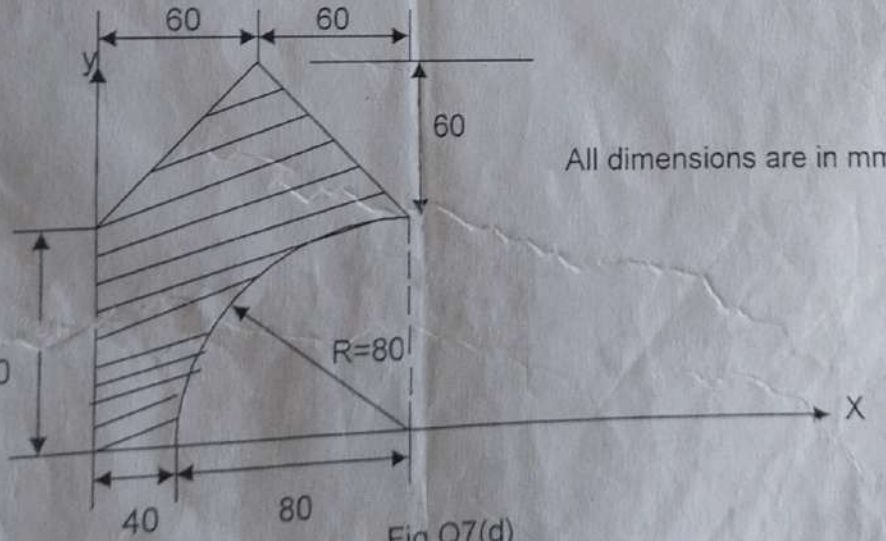
Unit – IV

State and prove parallel axis theorem. 05

Define radius of gyration with sketch. 02

Differentiate between centroid and centre of gravity. 03

Find the coordinates of the centroid of the hatched area with respect to the axes shown in Fig. Q (d).



All dimensions are in mm

Fig.Q7(d) 10

14CV103

Unit – II

3. a) State and prove Varignon's theorem. 05
   b) Define equivalent force couple system. Replace the force acting at A by an equivalent force-couple system acting at B as shown in Fig.Q3 (b).

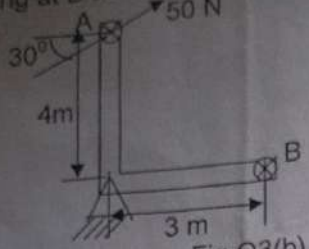


Fig.Q3(b)

   c) Find the magnitude, direction and position of resultant from point A for the system of forces shown in Fig.Q3(c). 03

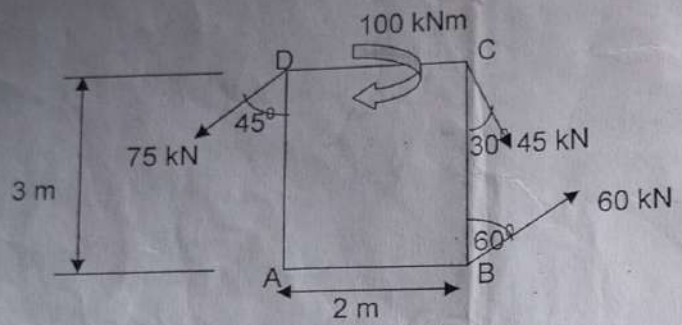


Fig.Q3(c)

4. a) Explain Equivalent force couple system with sketches. 10
   b) Define equilibrium. State the conditions of equilibrium for coplanar non concurrent force system
   c) Explain FBD with example 04
   d) Two spheres each of radius 100 mm weighs 5 kN are placed in a rectangular box as shown in Fig.Q4 (d). Calculate the reactions at all points of contact.

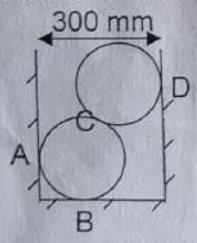


Fig.Q4(d)

Unit – III

5. a) Distinguish between roller support and hinged support with sketches.
   b) Determine the reactions for the cantilever beam subjected to loads as shown in Fig. 5(b).

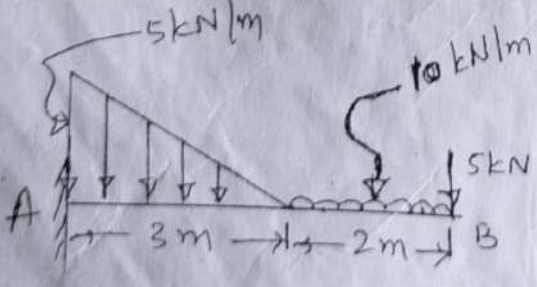


Fig. 5b

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

April - May 2015

14CV103 – ELEMENTS OF CIVIL ENGINEERING AND ENGINEERING MECHANICS

tion: 3 Hours

Max. Marks: 100

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

Unit – I

a) Explain the importance of (i) Water Resources Engineering (ii) Geotechnical Engineering (iii) Transportation Engineering. 06

b) Explain the characteristics of a force with an example. 04

c) Find the magnitude of force P and its inclination with respect to x – axis such that the resultant is a horizontal force of 1000 N acting towards right as shown in Fig. 1(c).

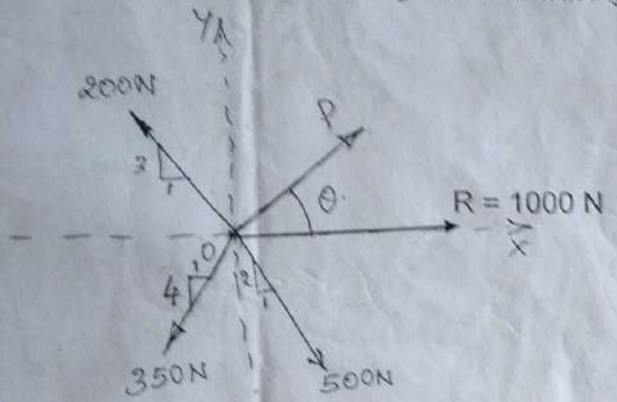


Fig. Q.1 (c)

10

) With the help of sketches distinguish between (i) Resolution and Composition of forces (ii) Coplanar and non-coplanar force system. 06

) Determine the magnitude and direction of forces F1 and F2 as shown in Fig. Q 2. (b). given that the resultant is to be 800 N along positive x- axis. 06

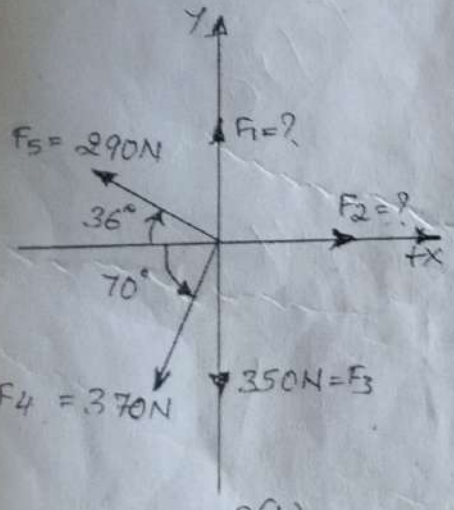


Fig. Q. 2(b)

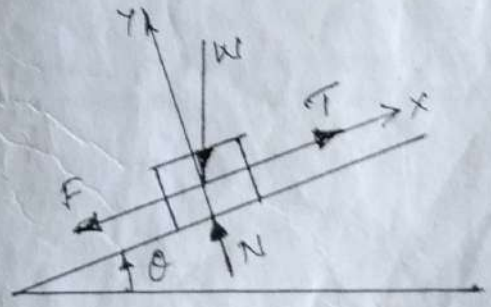
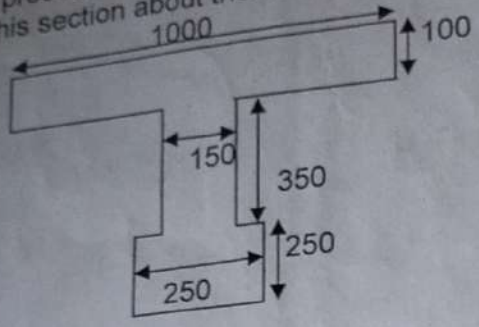


Fig. Q 2. (c)

A system of forces acting on a body resting on an inclined plane as shown in Fig. Q.2 (c). Determine the resultant force if Θ=30°, W=1000 N, N= 866 N, F= 200 N and T= 1200 N 08

d) The cross section of the prestressed concrete beam is as shown in Fig.Q8 (d). Calculate the moment of inertia of this section about the horizontal and vertical centroidal axis.



All dimensions are in mm

Fig.Q8(d)

Unit – V

9. a) Define direct central impact. Give equations for coefficient of restitution and law of conservation of momentum. Justify the loss of energy during impact.
   b) Determine acceleration of the blocks and tension in the strings for the system of blocks connected as shown in Fig.9 (b). Take coefficient of friction between the blocks and the plane as 0.2
   c) A ball is dropped from a height of 10 m on a smooth floor. If the height of first bounce is 8.1 m, determine i) coefficient of restitution and ii) expected height of second bounce.

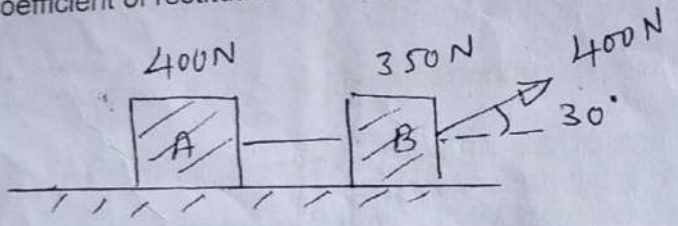


Fig. 9 (b)

10. a) State and explain D' Alembert's principle. Define effective force on a particle.
    b) A 10,000 kN train is accelerated at a constant rate up a 2% grade. The track resistance is constant at 10 N / kN. The velocity increases from 9 m/s to 18 m/s, in a distance of 1 km. Determine the maximum power developed by the locomotive. Use work –energy principle.
    c) State and prove impulse momentum principle.

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c) Determine the reactions at supports A and B for the beam loaded as shown in Fig. 5(c). 10

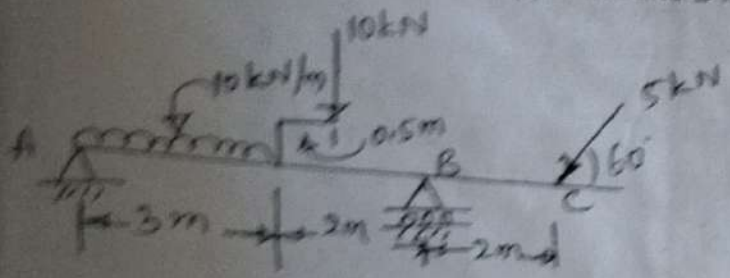

Fig. 5 (c)

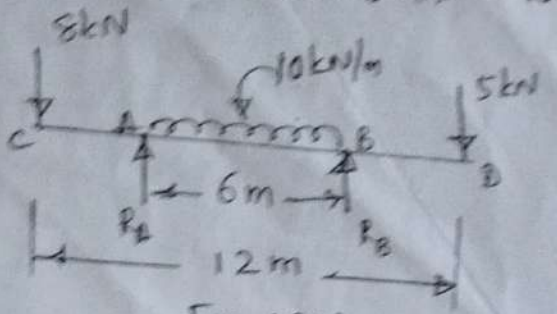

Fig. 6(b).

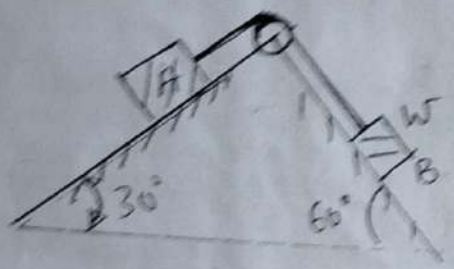

Fig. 6 (c)

6. a) Distinguish between simply supported beam and cantilever beam with sketches. Show the reactions at the supports. 04

b) Determine the positions of the supports for the beam loaded as shown in Fig. 6(b) such that the reactions at the supports are equal. 06

c) Determine the minimum weight W of block B for which the motion of blocks impend for the system of blocks connected as shown in Fig. 6(c). Take coefficient of friction between A and the plane as 0.2 and that between B and the plane as 0.3.Take weight of A as 1000 N 10

Unit – IV

a) Derive moment of inertia of the triangular lamina about its horizontal centroidal axis. 5

b) State and prove perpendicular axis theorem. 5

c) Determine the centroid of the area shown in Fig.Q7(c) with respect to the axis shown.

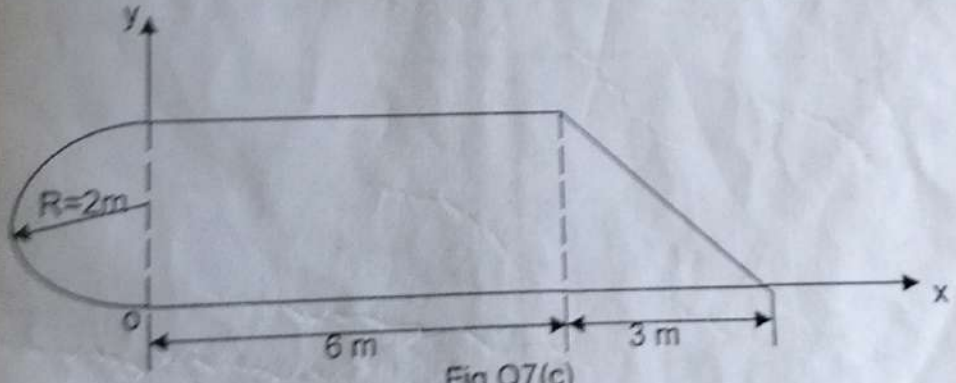

Fig.Q7(c) 10

a) Determine the centroid of sector of a triangle from first principles. 5

b) Explain the axis of symmetry and its uses with example. 3

c) Define built-up sections or composite sections with example. 2

d) In Fig.Q3 (d) the position BC of the string is horizontal and pulley is frictionless. Determine the tension in different parts of the string. Also find W_1 and W_2.

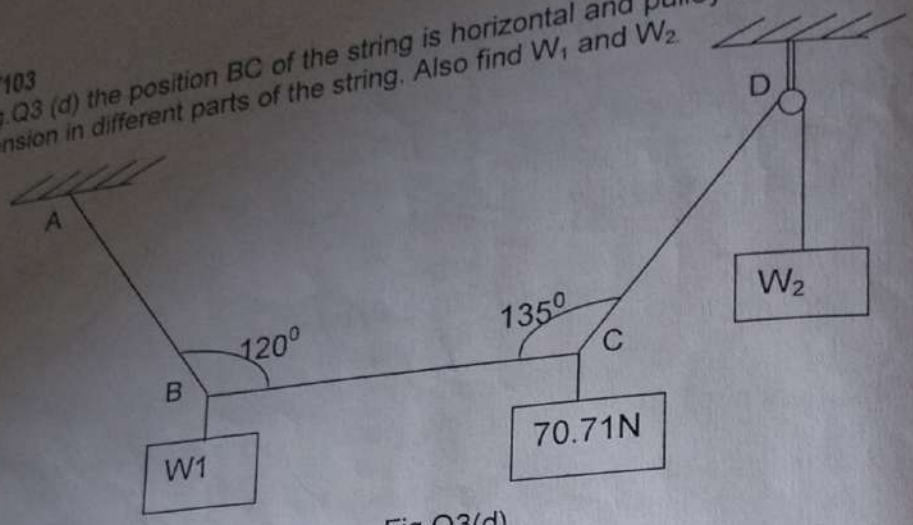

Fig.Q3(d)

4. a) Differentiate between coplanar concurrent and coplanar non concurrent force system. Mention the conditions of equilibrium in each case.
   b) State varignon's theorem.
   c) A ball weighing 1000 N is at rest in a trough as shown in Fig.Q4(c). Determine the reaction at contact points.

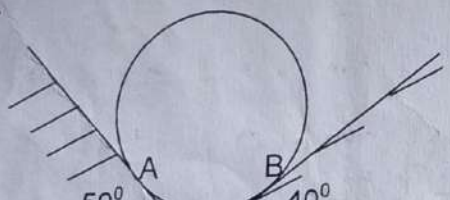

Fig.Q4(c)

d) Find the resultant of the system of coplanar forces acting on a lamina shown in Fig.Q4 (d). Each square has a side of 10 mm. Locate the position of resultant with respect to 'O'.

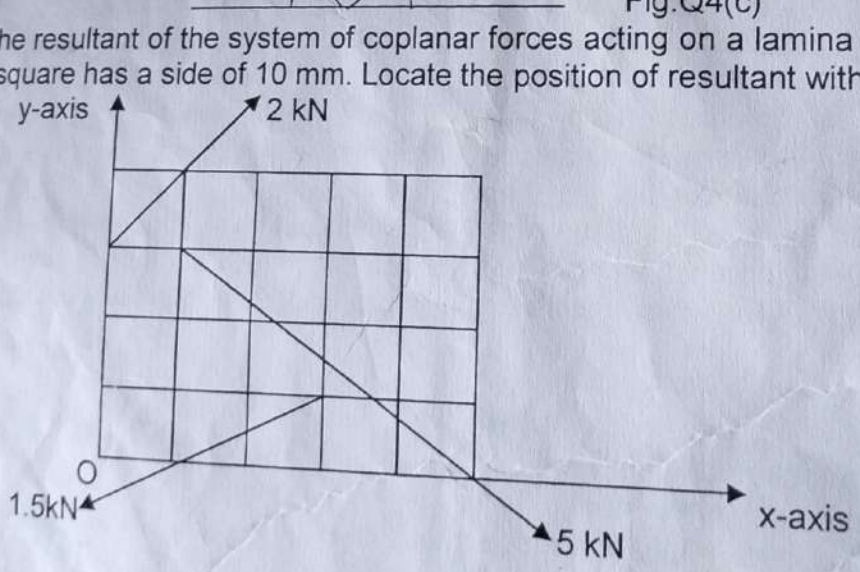

Fig.Q4(d)

Unit – III

5. a) State any four Coulomb's laws of dry friction.
   b) A ladder 5 m long weighing 250 N is resting against a smooth vertical wall and a rough horizontal floor making an angle α with respect to the horizontal. When a 750 N man stands at the top of the ladder, the ladder begins to slip. Determine the angle α for which the ladder does not slip. Take coefficient of friction between the ladder and the floor 0.5.

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

Make up / Supplementary Examinations - July 2015

14CV103 – ELEMENTS OF CIVIL ENGINEERING AND ENGINEERING MECHANICS

Duration: 3 Hours

Max. Marks: 100

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

Unit – I

1. a) Explain the importance of (i) Structural Engineering (ii) Surveying (iii) Transportation Engineering. 6
   b) State and explain principle of transmissibility. State its limitations. 6
   c) The system of four forces acting at a point is as shown in Fig. Q.1(c). Determine their resultant force. 8

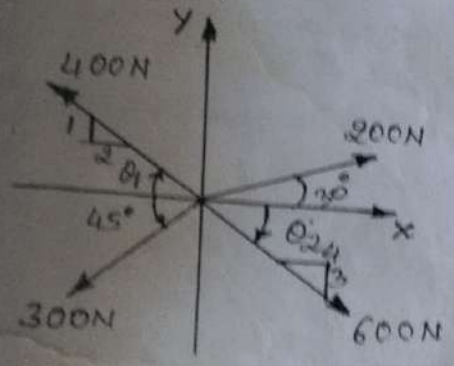

Fig. Q.1.(c)

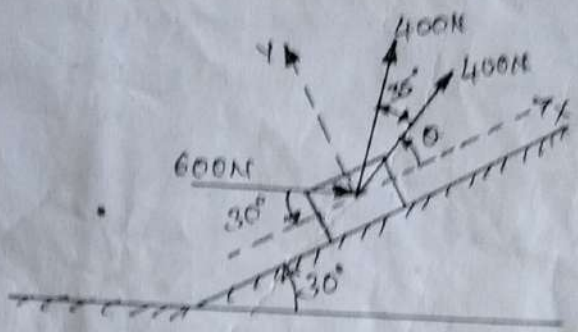

Fig Q. 2(c)

2. a) Define (i) Continuum (ii) Rigid body (iii) particle 6
   b) i) Distinguish between Force and Force system with example.
   ii) State the axioms of mechanics 6
   c) Three forces acting on the block resting on an inclined plane are as shown in Fig. Q 2 (c). The direction of 400 N forces may vary, but the angle between them is always 35°. Determine the value of Θ for which the resultant force is directed parallel to the inclined plane. 8

Unit – II

3. a) Mention any 4 characteristics of a couple. 4
   b) Define equivalent force – couple system. 2
   c) Determine moment of a force 100N with respect to A as shown in Fig.Q3(c).

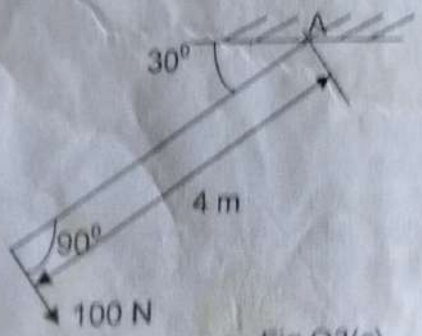

Fig.Q3(c) 4

c) Locate the centroid of the shaded section as shown in Fig.7(c) 08 L5

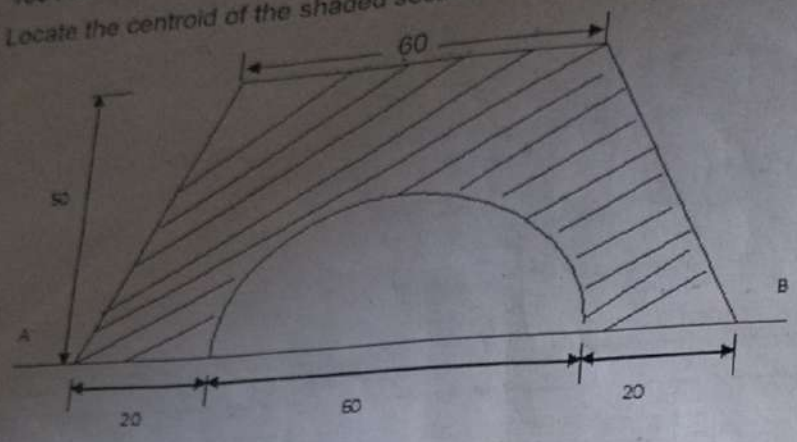

Fig no: 7(C)

Note: All dimensions are in mm

8. a) Derive an expression for centroid of a semicircular area from the method of Integration 06 L3

b) Explain the method of moments to locate the centroid of a plane area 06 L3

c) Determine the second moment of the shaded area of the section with respect to AB as shown in Fig.7(c) 08 L4

Unit – V

9. a) State and prove work-energy principle. 06 L2

b) A ball of mass 40 kg moving with a velocity of 8m/s strikes directly another ball of mass 30 kg moving in the opposite direction with a velocity of 10m/s. If the co-efficient of restitution is 0.75, what is the velocity of ball after the impact? 04 L3

c) A short commuter train consists of three coaches, each of 6000 kg mass. If the frictional resistance is 0.5 kN/1000kg mass determine the tractive force of the train, if it has to attain a speed of 60 kmph in 10 sec. Also determine the tension in each of the coupling between the coaches.

10. a) Explain direct central impact and coefficient of restitution. 10 L3

b) Explain D'Alembert's principle. 05 L2

c) A block of certain mass slides down a rough inclined plane of an angle θ as shown in Fig. 10 (c). Determine the velocity of the block as it slides down the plane through a height h starting from rest. What is the velocity if $\theta = 30^0$, h=1m and $\mu = 0.24$. Use work-energy method. 05 L2

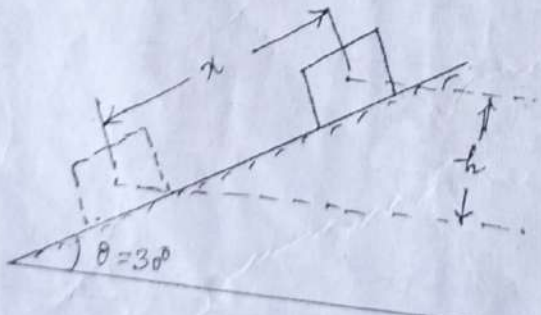

Fig. 10 (c)

* Bloom's Taxonomy, L* Level

10 L3

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c) Determine the support reactions for the beam shown in Fig. 5(c)

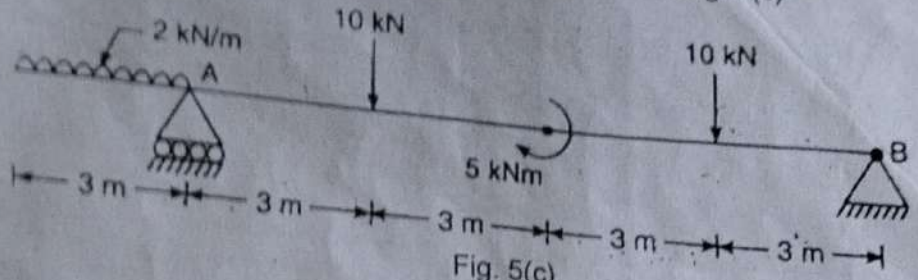

Fig. 5(c)

10 L5

a) Explain (i) limiting friction (ii) angle of friction

04 L2

b) List the Coulomb's laws of friction.

06 L1

c) A blocks A and B weighing 4kN and 2.5kN respectively, are connected by a wire passing over a smooth pulley as shown in Fig. 6(a). Determine the magnitude of force P to cause motion of the blocks to impend. Take coefficient friction at contact surfaces as 0.2.

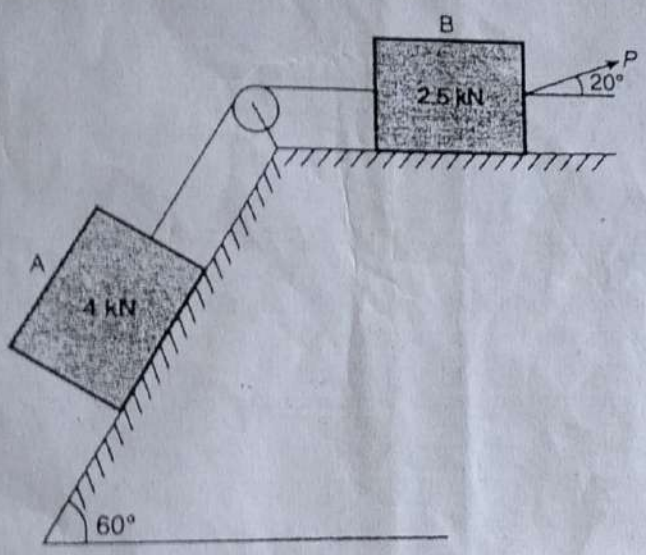

Fig. 6(a)

10 L5

Unit – IV

a) Define radius of gyration with a sketch. Derive an expression for moment of inertia of a rectangular lamina about its centroidal axis.

L1
06 L4

b) While first moment of the area explains the centroid, what does second moment of the area stands for? Define these terms and mention any one practical application in each case.

06 L3

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Unit – II

3. a) State the conditions of equilibrium for coplanar concurrent force system. Check for equilibrium for the force acting on the plate as shown in Fig.Q3(a) 05

b) Determine the weight W carried by the string BC for the system of strings in equilibrium as shown in Fig.Q3(b). 05

c) Determine the resultant of the force system acting on the plate as shown in Fig.Q3(c) 10

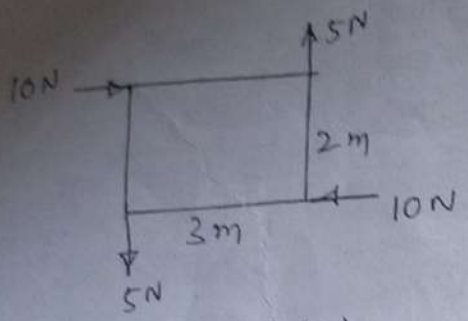

Fig. Q3(a)

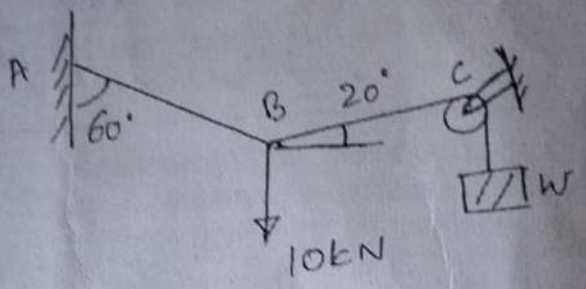

Fig. Q3(b)

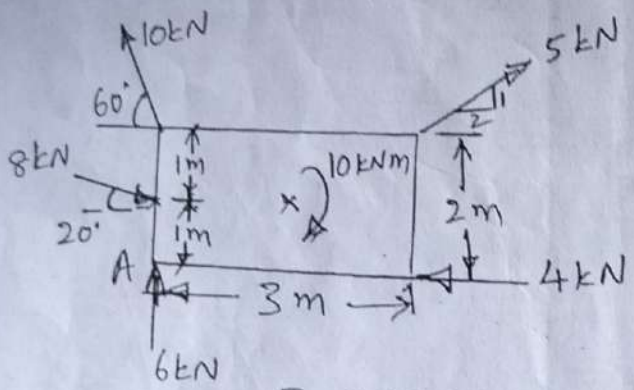

Fig. Q3(c)

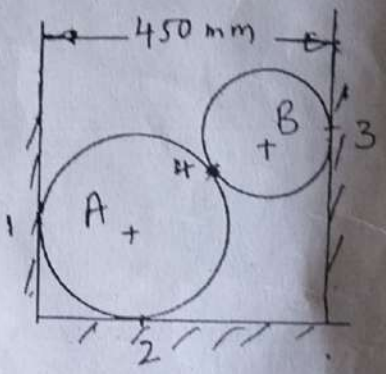

Fig. Q4(c)

4. a) Distinguish between (i) Resultant and Equilibrant (ii) Moment and couple 04

b) Explain (i) Equivalent couple (ii) Equivalent force couple system 06

c) Determine the reactions at the contact points for the two cylinders placed in a trench as shown in Fig.Q4(c).Take weight of A as 200 N and that of B as 100 N, radius of A as 200 mm and that of B as 100 mm. 10

Unit – III

5. a) What is the difference between determinate and indeterminate beams? Give examples in each case. 04

b) Name and explain different types of loads with neat sketches. 06

USN

NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

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

November - December 2015

15CV103 – 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.***

Unit – I

		Marks	BT*
a)	Explain briefly the Scope of Civil Engineering in i) Water Resource engineering ii) Geo-technical Engineering	06	L*2
b)	State and Explain principle of Transmissibility. State its Limitations.	06	L2
c)	Determine the magnitude and direction of the resultant for the given force system shown in Fig.Q1(c).	08	L3

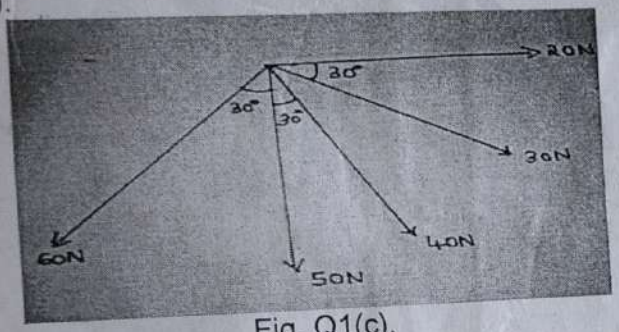

Fig. Q1(c).

a)	Explain the different types of force System with examples.	08	L2
b)	Explain the Concept of free body diagram with examples.	04	L2
c)	Two Cables which have known Tension T_1=3kN and T_2=6kN are attached to a point B at a pole. The third Cable BC is used as a guide wire and is attached at B. Determine the required tension in cable BC so that the resultant force exerted by three cables will be vertical. Find the magnitude of resultant. Refer Fig. Q2(c)	08	L4

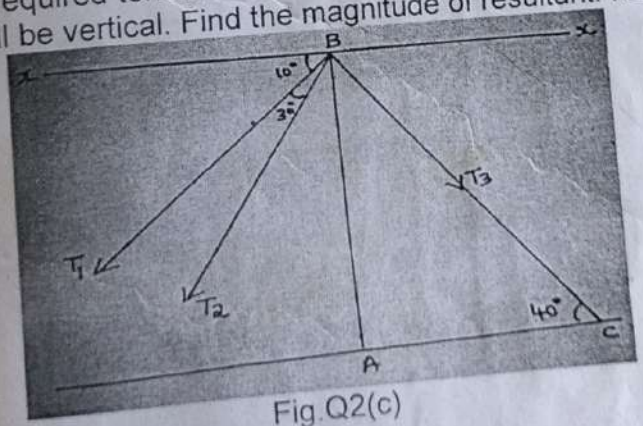

Fig.Q2(c)