NMAM INSTITUTE OF TECHNOLOGY, NITTE
Off-Campus Centre of Nitte (Deemed to be University)
First Semester B.Tech. (CBCS) Degree Examinations
December 2022
CV1001-1 – ELEMENTS OF CIVIL ENGINEERING

Duration: 3 Hours | Max. Marks: 100

**Note:**

1) Part – A: Multiple Choice Questions: Answer all **Twenty** questions in the **OMR Sheet** provided. Each question carries equal marks.
Part – B: Descriptive Answer type Questions: Answer **Five full** questions choosing **Two full** questions from **Unit – I & Unit – II each** and **One full** question from **Unit – III.**

2) Assume the Missing data suitably and mention the same.

**20 Marks**

## PART - A: MULTIPLE CHOICE QUESTIONS

1. _____ is the branch of Civil Engineering which deals with measurement of relative positions of an object on earth's surface by measuring the horizontal distances, elevations, directions, and angles.
   A) Surveying B) Geotechnical Engineering
   C) Transportation Engineering D) Construction Technology
2. The mixture of cement and sand with water is called _____
   A) brick B) concrete
   C) steel D) mortar
3. The mixture of cement, sand and aggregates with water is called _____
   A) mortar B) concrete
   C) steel D) brick
4. _____ is the branch of Civil Engineering which involves assessing slope stability, study of soil properties and the risk of landslides, rock fall and avalanches.
   A) Geotechnical Engineering B) Structural Engineering
   C) Transportation Engineering D) Construction Technology
5. The effect of a couple is unchanged if _____
   A) The couple is replaced by another pair of forces, whose rotational affects are the same B) The couple is rotated through any angle
   C) The couple is shifted to any other position D) All of these
6. _____ has same magnitude as that of the Resultant but opposite in direction to it, acting on same line of action of resultant.
   A) equilibrant B) couple
   C) point force D) moment
7. Which of the following is the unit of Moment?
   A) kN B) kN-m
   C) $kN/m^2$ D) $kN-m^2$
8. Moment of a force depends on _____
   A) Moment centre only B) Lever arm only
   C) Moment centre and lever arm D) None of these
9. The loading generally acts upon the _____ of the body.
   A) Centroid B) Symmetrical centre
   C) Rotational centre D) Construction Technology
10. A simple support offers only _____ reaction normal to the axis of the beam.
    A) Horizontal B) Vertical
    C) Inclined D) Moment
11. _____ support develops support moment.
    A) Hinged B) Simple
    C) Fixed D) Roller
12. Example for cantilever beam is _____
    A) Railway sleepers B) Roof slab
    C) Bridges D) Chejja

13. **Friction always** _____
A) opposes the motion B) both of these
C) helps the motion D) none of these

14. **Which one of these characteristics does a smooth surface has**
A) Frictionless B) sometimes less & some time more force
C) more frictional force D) less frictional force

15. **Friction force exerts in the case of** _____
A) Non-Contact Surface B) Magnetic Force
C) Contact Surface D) Non-Magnetic Force

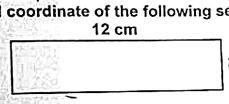
16. **The frictional resistance is developed due to** _____ **of the surface irregularities at the contact surfaces of two bodies**
A) Binding B) Interlocking
C) Collision D) Non interlocking

17. **The point through which the whole weight of the body acts is called** _____
A) Inertial point B) Center of gravity
C) Centroid D) None of the above

18. **The point at which the total area of a plane figure is assumed to be concentrated is called** ___
A) Inertial point B) Centre of gravity
C) Central point D) Centroid

19. **Where will be the center of gravity of a uniform rod lies?**
A) At its center of its cross-sectional area B) At its end
C) At its middle point D) Depends upon its material

20. **Centroidal coordinate of the following section is** _____




A) (6, 3) B) (6, 6)
C) (6, 1.5) D) (1.5, 3)

## PART - B: DESCRIPTIVE ANSWER QUESTIONS

| | | Marks | BT* | CO* | PO* |
|---|---|---|---|---|---|
| | **Unit – I** | | | | |
| 1. a) | Explain the following scopes of Civil Engineering. i) Environmental Engineering and ii) Structural Engineering. | 4 | L2 | 1 | 1,2 |
| b) | Define force and explain its four characteristics. | 4 | L2 | 1 | 1,2 |
| c) | Determine the reactions at contact points of two smooth spheres A and B resting in a rectangular trench as shown in Fig. Q1(c) having radius 100 mm and 50 mm respectively and weighs 250 N and 150 N respectively. | 8 | L3 | 2 | 1,2 |

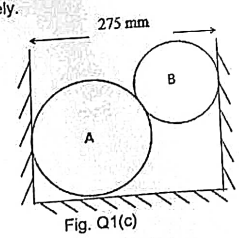



Fig. Q1(c)

| | | | | | |
|---|---|---|---|---|---|
| 2. a) | Define Equilibrium and Equilibrant of force. | 4 | L2 | 2 | 1,2 |
| b) | State Varignon's Principle with the expression. | 4 | L2 | 2 | 1,2 |
| c) | Determine the magnitude and direction of the resultant force for the force system as shown in Fig. Q2(c). | | | | |

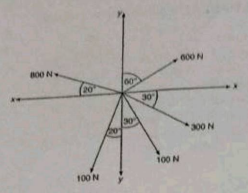



Fig. Q2(c)

| | | | | | |
|---|---|---|---|---|---|
| | | 8 | L3 | 1 | 1,2 |
| 3. | a) Explain four basic idealization of engineering mechanics. | 4 | L2 | 1 | 1,2 |
| | b) Explain Coplanar collinear and coplanar concurrent force system with example. | 4 | L2 | 1 | 1,2 |
| | c) Determine the resultant of the coplanar non concurrent force system with respect to point 'C' as shown in Fig. Q3(c). | | | | |

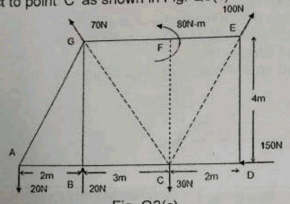



Fig. Q3(c) 8 L3 2 1,2

**Unit – II**

| | | | | | |
|---|---|---|---|---|---|
| 4. | a) Explain static friction and dynamic friction. | 4 | L2 | 4 | 1,2 |
| | b) Define i) angle of friction and ii) angle of repose. | 4 | L1 | 4 | 1,2 |
| | c) Determine the supports reactions for the loaded beam shown in Fig. Q4(c). | | | | |

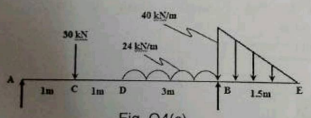



Fig. Q4(c) 8 L3 3 1,2

| | | | | | |
|---|---|---|---|---|---|
| 5. | a) Explain Triangular and Trapezoidal loading. | 4 | L2 | 3 | 1,2 |
| | b) Explain any two types of supports with neat sketches. | 4 | L2 | 3 | 1,2 |
| | c) Block A weighing 1000N and block B weighing 500N are connected by flexible cable. The coefficient of friction between block A and the plane is 0.5 and that for block B and the floor is 0.2. Determine the value of inclination to the plane, if the system has an impending motion towards the ground as shown in the Fig. Q5(c). | | | | |

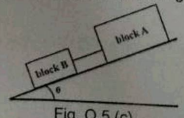



Fig. Q 5 (c) 8 L3 4 1,2

| | | | | | | |
|---|---|---|---|---|---|---|
| 6. | a) | Explain statically determinate and statically indeterminate beams with example. | 4 | L2 | 3 | 1,2 |
| | b) | Explain cantilever beam with neat sketch. | 4 | L2 | 3 | 1,2 |
| | c) | Two identical planes AC and BC inclined at an angle of 60° and 30° to the horizontal meets at a point C as shown in the Fig. Q6(c). A block of 1000N rests on the inclined plane BC and is tied by a cable passing over a pulley to another block weighing "W" which is resting on the plane AC. The co-efficient of friction of plane AC is 0.2 and that of plane BC is 0.28. Find the least value of a block "W" for the equilibrium of the system. | 8 | L3 | 4 | 1,2 |

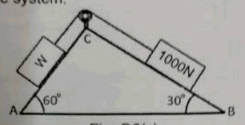



Fig. Q6(c)

**Unit – III**

| | | | | | | |
|---|---|---|---|---|---|---|
| 7. | a) | State and prove perpendicular axes theorem with the neat sketch. | 4 | L2 | 5 | 1,2 |
| | b) | Derive an expression for moment of inertia of a Triangular lamina about its base by using method of integration. | 4 | L3 | 5 | 1,2 |
| | c) | Locate the centroid of the shaded area shown in the Fig. Q7(c) with respect to the given axis | 8 | L3 | 5 | 1,2 |

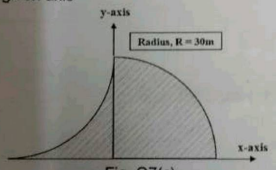



Fig. Q7(c)

| | | | | | | |
|---|---|---|---|---|---|---|
| 8. | a) | Explain centroid and center of gravity. | 4 | L2 | 5 | 1,2 |
| | b) | Derive the centroid of a rectangle of height 'h' and base 'b'. | 4 | L3 | 5 | 1,2 |
| | c) | Calculate moment of inertia for the 'I' section shown in the Fig. Q8(c) about its centroidal axis. | 8 | L3 | 5 | 1,2 |

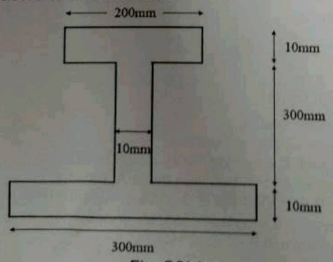



Fig. Q8(c)

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

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USN | | | | | | | | | | |

# NMAM INSTITUTE OF TECHNOLOGY, NITTE

*(An Autonomous Institution affiliated to VTU, Belagavi)*

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

April.- May 2022

**21CV103 – ELEMENTS OF CIVIL ENGINEERING**

Duration: 3 Hours

Max. Marks: 100

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

**Unit – I**

| | | Marks | BT* | CO* | PO* |
|---|---|---|---|---|---|
| 1. a) | Discuss the scopes of Structural Engineering and Environmental Engineering. | 04 | L*1 | 1 | 1 |
| b) | Determine the resultant of force system shown in Figure 1(b). | | | | |

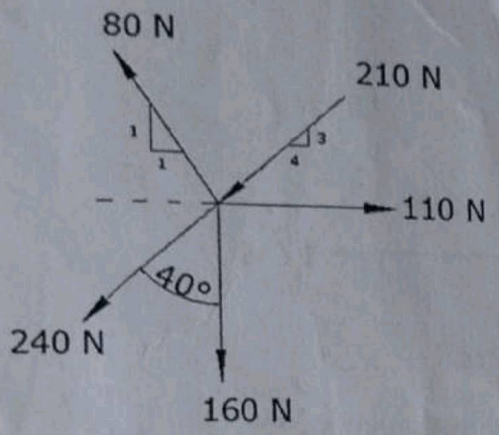


Figure 1 (b)

| | | | | | |
|---|---|---|---|---|---|
| c) | Determine the resultant of force system shown in Figure 1(c) with respect to point A. | 06 | L3 | 1 | 2 |

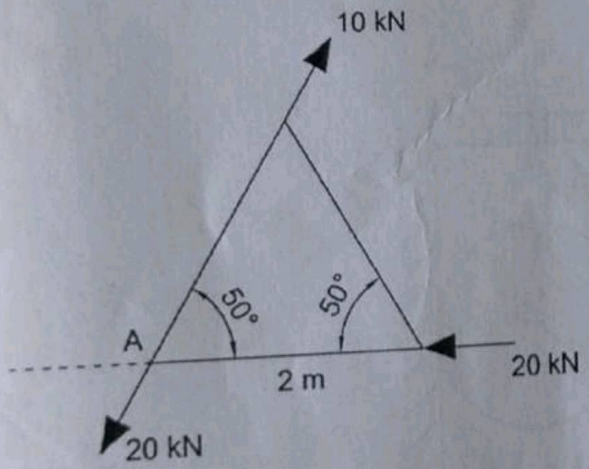


Figure 1 (c)

| | | | | | |
|---|---|---|---|---|---|
| | | 10 | L3 | 2 | 2 |

2. a) Define couple and state any two characteristics of couples. 04 L1 1 1
   b) Replace the force acting at C as shown in Figure 2 (b) by Force and couple at points A and B.

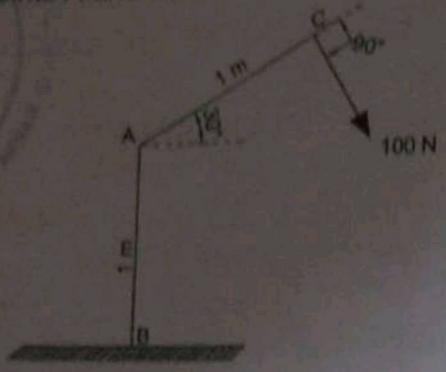


Figure 2 (b)

06 L3 1 2

   c) Forces acting in a joint is shown in Figure 2 (c). Determine the magnitude and direction of missing force such that resultant is zero.

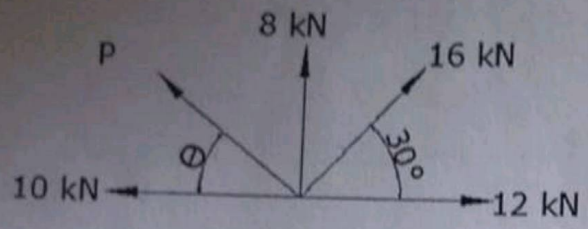


Figure 2 (c)

10 L3 2 2

3. a) Define free body diagram and explain with neat sketch. 04 L1 1 1
   b) Explain any three force system with neat sketches. 06 L2 1 2
   c) A cylinder A of radius 100 mm is placed over Cylinder B of radius 200 mm in a rectangular box as shown in Figure 3 (c). The weight of cylinders A and B are respectively 200 N and 400 N. Determine the support reactions at all contact points.

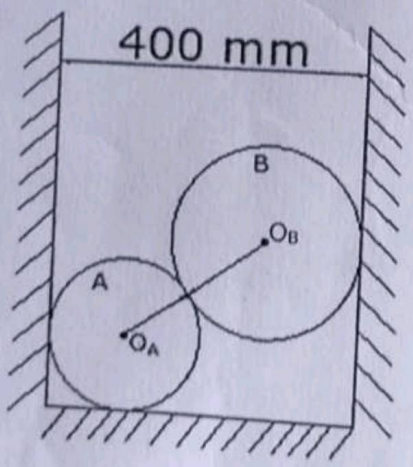


Figure 3 (c)

10 L3 2 2

## Unit – II

| | | | | | | |
|---|---|---|---|---|---|---|
| 4. | a) | Distinguish between hinged support and fixed support using free body diagrams. | 04 | L1 | 3 | 2 |
| | b) | Determine the reactions at supports A and B for the beam loaded as shown in Figure 4 (b). | | | | |

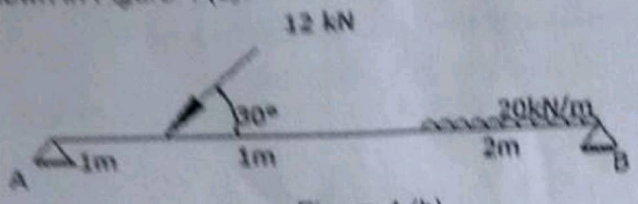


Figure 4 (b)

| | | | | | | |
|---|---|---|---|---|---|---|
| | c) | A ladder 4 m long weighing 200 N is placed against a vertical wall and horizontal floor. It makes an angle of 65 degrees with horizontal floor. The coefficient of friction between wall and ladder is 0.10 and that between floor and ladder is 0.25. A man weighing 600 N is climbing the ladder. Determine the location of man when the ladder is about to slip. | 06 | L3 | 3 | 2 |
| 5. | a) | Prove that angle of repose is equal to angle of friction. | 10 | L3 | 4 | 2 |
| | b) | Two blocks are connected as shown in Figure 5 (b). Determine the magnitude of force P to impend motion and tension in the string. Assume angle of friction as 15 degrees for all contact surfaces. | 04 | L2 | 4 | 2 |

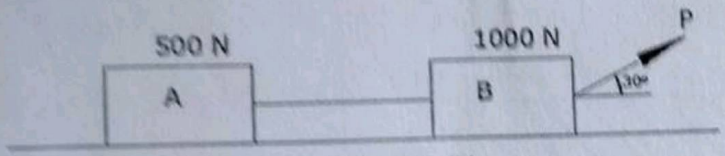


Figure 5 (b)

| | | | | | | |
|---|---|---|---|---|---|---|
| | c) | Determine the reactions at supports A and B for the beam loaded as shown in Figure 5 (c). | 06 | L3 | 4 | 2 |

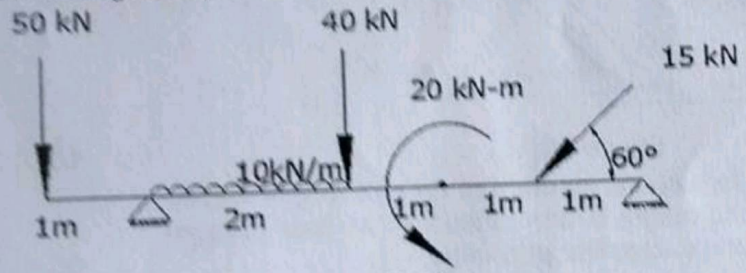


Figure 5 (c)

| | | | | | | |
|---|---|---|---|---|---|---|
| 6. | a) | List the types of loads and explain any two types. | 10 | L3 | 3 | 2 |
| | b) | A cantilever beam is loaded as shown in Figure 6 (b). Determine the reactions at support A. | 04 | L1 | 3 | 2 |

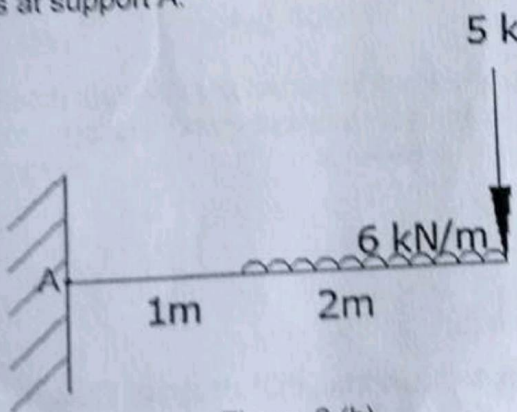


Figure 6 (b)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | 06 | L3 | 3 | 2 |

c) Two blocks are connected by a string which passes over a frictionless pulley as shown in Figure 6 (c). The block A weighs 1000 N and coefficient of friction is 0.20 for all contact surfaces. Determine the weight of block B to impend motion of block A downwards.

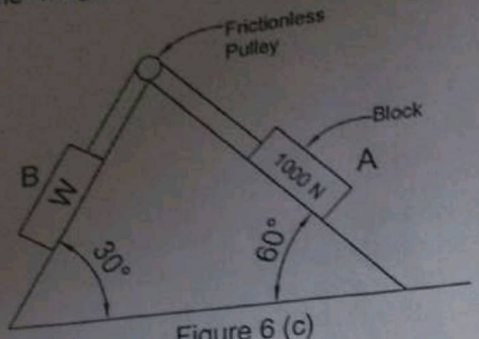


Figure 6 (c)

10 L3 4

## Unit – III

7. a) State and prove parallel axis theorem. 05 L2 5
   b) Locate the centroid of semicircular area of radius R. 05 L3 5
   c) Determine the centroid of the area as shown in Figure 7 (c).

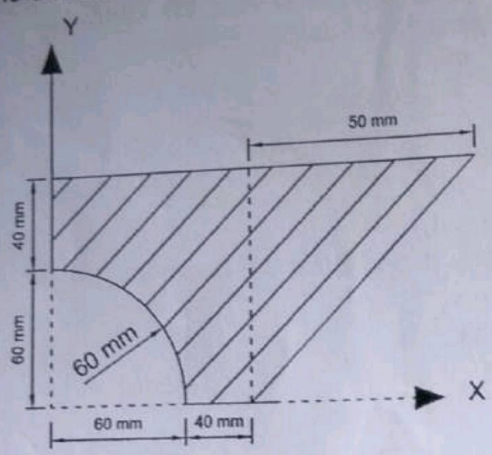


Figure 7(c) 10 L3 5

8. a) Derive an expression for second moment of area of a right-angled triangle with base b and height h with respect to an axis passing through the base of triangle from first principles. 06 L2 5
   b) Determine the centroid and radius of gyration of the area with respect to the X and Y axes as shown in Figure 8 (b).

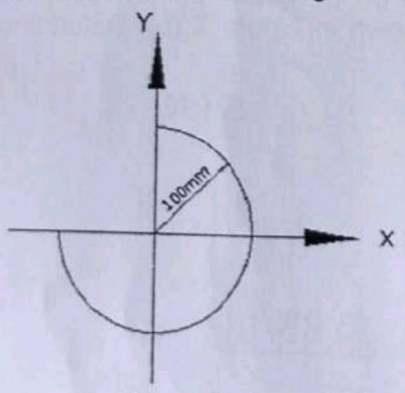


Figure 8 (b) 14 L3 5

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

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I year BE

USN

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*(An Autonomous Institution affiliated to VTU, Belagavi)*

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

September - October 2022

**21CV103 – ELEMENTS OF CIVIL ENGINEERING**

Duration: 3 Hours | Max. Marks: 100

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

| | | | Marks | BT* | CO* | PO* |
|---|---|---|---|---|---|---|
| | | **Unit – I** | | | | |
| 1. | a) | Explain in brief the scope of following Civil Engineering Fields.<br>i) Building materials and construction technology<br>ii) Geotechnical Engineering | 6 | L*2 | 1 | 1 |
| | b) | Define Force. Explain in brief about characteristics of force. | 4 | L2 | 1 | 1 |
| | c) | A System of connected flexible cable as shown in Fig. Q 1. (c) is supporting two vertical forces 200 N and 250 N at points B and D. Determine forces in various segments of the cable. | 10 | L3 | 2 | 1,2 |

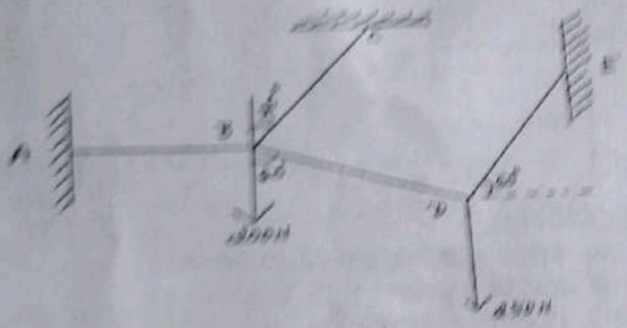

Fig. Q 1(c)

| | | | | | | |
|---|---|---|---|---|---|---|
| 2. | a) | Solve the co-planar Non Concurrent force system that are acting on a laminar as shown in Fig. Q 2(a), where sides of square are 1m. Find the magnitude, direction and position of resultant force with respect to point 'O'. | 10 | L3 | 1 | 1, 2 |
| | b) | Write a short note on principle of transmissibility of forces. | 4 | L2 | 1 | 1 |

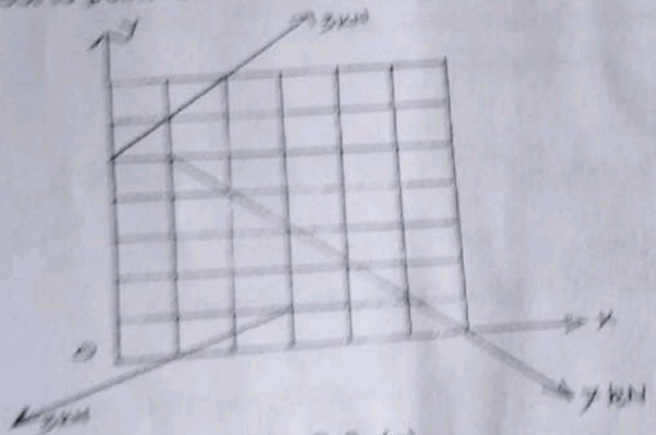

Fig. Q 2. (a)

c) A block of weight 200 N is kept on the inclined plane and also fixed to plane. Find the components of weight along the plane and perpendicular to the plane of forces in Fig. Q 2. (c)

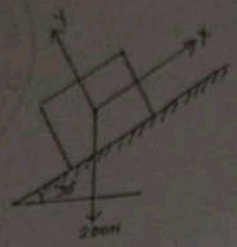


Fig. Q 2. (c)

6 L3 1 1,2

3. a) Find the magnitude and direction of resultant of co-planar force system as shown in Fig. Q 3. (a).

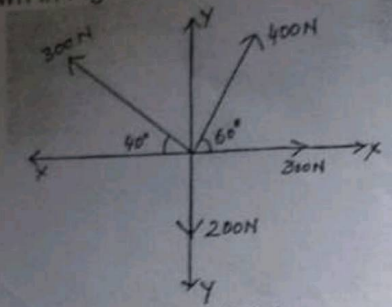


Fig. Q 3. (a)

10 L3 1 1,2

b) Replace the force and couple system by a single force and couple using equivalent force couple system with respect to point 'O' as shown in Fig. Q 3. (b). Also determine magnitude and its directions.

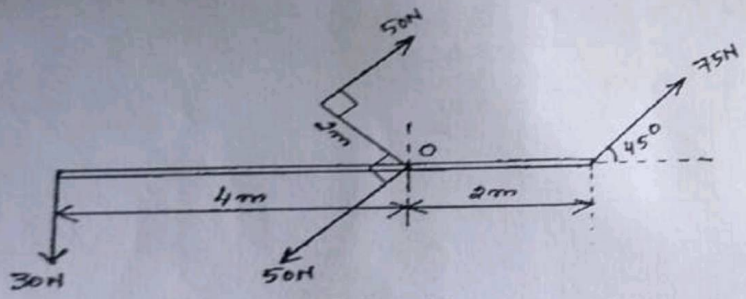


Fig. Q 3. (b)

10 L3 2 1,2

**Unit – II**

4. a) Determine support reactions of loaded beam as shown in Fig. Q 4. (a)

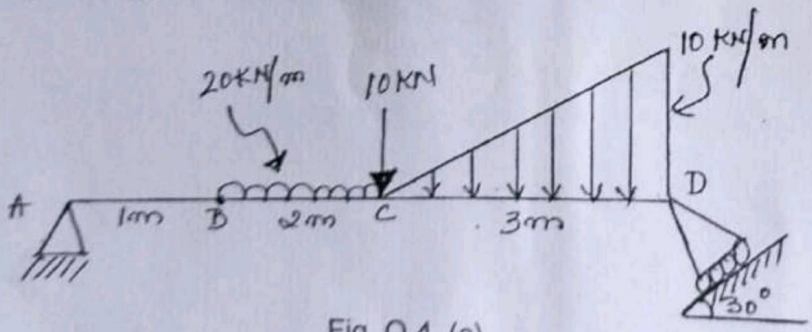


Fig. Q 4. (a)

10 L3 3 1,2

b) What should be the value of θ as shown in the Fig. Q 4. (b), which can make the motion of 900 N block down the plane to impend? The co-efficient of friction of all contact surface is $\frac{1}{3}$.

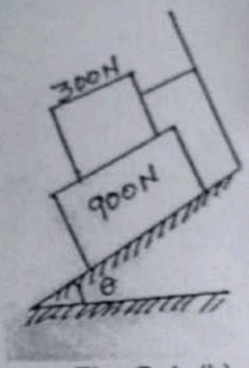


Fig. Q 4. (b) 10 L3 4 1,2

5. a) Determine the support reaction of loaded beam as shown in Fig. Q 5. (a)

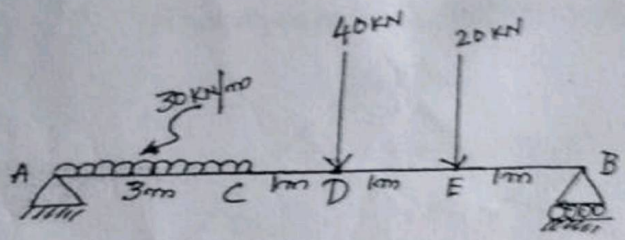


Fig. Q 5. (a)

b) Write a short note on types of friction. 10 L3 3 1,2

c) Write any five laws of static friction. 5 L2 4 1

5 L2 4 1

6. a) Calculate the reaction at support 'A' for beams as shown in Fig. Q 6. (a). The beam is hinged at 'A' and supported by cable at 'C' as indicated.

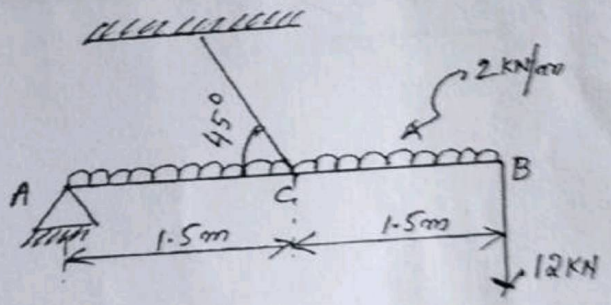


Fig. Q 6. (a)

b) Distinguish hinged support and roller support. 6 L3 3 1,2

c) Explain the following: 4 L1 3 1

i) Angle of friction

ii) Angle of repose 10 L2 4 1,2

## Unit – III

7. a) Derive an expression for centroid of quarter-circle on its diametrical axis. 6 L3 5 1,2

| | | | | | |
|---|---|---|---|---|---|
| | b) | Write the statement of perpendicular and parallel axes theorem. | 4 | L2 | 5 |
| | c) | Determine the centroid for the lamina with a circular cut out as shown in Fig. Q 7(b). | 10 | L3 | 5 |

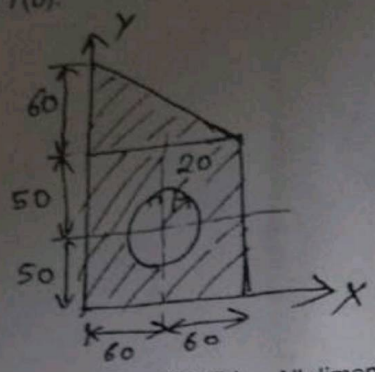


Fig. Q 7 (b) All dimensions are in mm

| | | | | | |
|---|---|---|---|---|---|
| 8. | a) | Derive an expression for moment of inertia for triangular section with respect to its base and horizontal centroidal axes. | 10 | L3 | 5 |
| | b) | Calculate the least radius of gyration for the section as shown in the Fig. Q 8. (b) | | | |

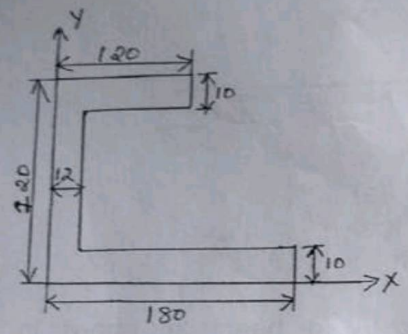


Fig. Q 8. (b) All dimensions are in mm 10 L3 5

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

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