OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE
FACULTY OF ENVIRONMENTAL DESIGN AND MANAGEMENT
DEPARTMENT OF BUILDING
HARMATTAN SEMESTER EXAMINATION 2012/2013 SESSION

BLD 205: BUILDING AND ARCHITECTURAL SCIENCE
B.Sc. Building and Quantity Surveying JUNE/JULY, 2013.

INSTRUCTIONS: Answer ALL Questions in PART A and ANY Other Question in PART B.
TIME ALLOWED: 2HOURS

## PART A

1 (a) The following materials are to be used during the construction of ductwork in building projects awarded to your company. Explain briefly the likely modes of application and the required jointing techniques for them:
(i) Stainless steel, (ii) Resin-bonded glass fibre, (iii) UPVC,
(iv) Galvanized mild steel, and (v) Plaster board **(20 Marks)**

(b) State the design temperatures required for the following types of building spaces:
(i) Living room _____, (ii) Bedroom _____, (iii) Classroom_____,
(iv) Factories _____, (v) Shops_____.

**(5 Marks)**

(c ) State the required air changes per hour required in the following types of buildings:
(i) Factories (industrial units)_____, (ii) Bedroom _____
(iii) Classrooms_____, Factories _____, (v) Shops_____

**(5 Marks)**

(d) Discuss any seven benefits of ventilation in a building. **(14 Marks)**

(e) Write briefly on the modes of construction by the following people:
(i) Babylonians (ii) Greek (iii) Assyrians (iv) Egyptians **(12 Marks)**

(f) Using relevant examples and annotated illustrations, explain how the inhabitants of tropical and temperate environment respectively modify the modes of design and construction of their buildings so as to act as an environmental filter. **(20 Marks)**

2a. You have been commissioned by the Rivers State Government to act in the capacity of a consultant in the proposed Mass Low Cost Housing Scheme in the three senatorial districts of the state. Explain briefly the **Major Comfort Mandates** that you would require the design and construction teams to be involved in the project to holistically consider in their outputs. **(15 Marks)**

b. Discuss the likely environmental risks associated with the use and operation of engineering service items in buildings. **(15 Marks)**

## PART B

3a. *Explain the processes involved in the lighting design of a building through the use of Lumen Design Method.* **(20 Marks)**

b. Explain the functions of the major components that are useful in the efficient functioning of mechanical ventilation system in buildings. **(30 Marks)**

4a Discuss the modes of heat transmission in buildings. **(30 Marks)**

b. Explain the principles of natural and artificial lighting system in buildings. **(20 Marks)**

OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE
FACULTY OF ENVIRONMENTAL DESIGN AND MANAGEMENT
DEPARTMENT OF BUILDING
HARMATTAN SEMESTER EXAMINATION 2016/2017 SESSION

**BLD 205: BUILDING AND ARCHITECTURAL SCIENCE**
**B.Sc. Building and Quantity Surveying** **August/September 2017**

**INSTRUCTIONS: Answer ALL Questions in PART A and ANY Other Question in PART B.**
**TIME ALLOWED: 2HOURS**

## PART A

1(a) The external wall of a building has two windows and each measures 2.4m by 1.25m. Calculate the rate of fabric loss through the windows when the inside comfort temperature is $22^0$C and the outside air temperature is $10^0$C. Thermal transmittance is 6.2 W/m$^2$K. **(5 Marks).**

(b) The geometry of a building under consideration is 4m x 3m x 3m high. On one side of the wall, there are two windows and each side is 1.2m by 0.6m; and at the other side of the wall, there is a door that is dimensioned 1.75m by 0.9m. The construction of the building has the following U-Values in W/m$^2$K:
- Windows: 5.6, Door- 2.0, Walls- 2.5, Roof- 3.0 and Floor- 1.5.

The comfort (internal) temperature is 18°C while the outside air temperature is 6°C. The volumetric specific heat capacity of air is 1400J/m$^0$C and the rate of air changes per hour is 1.7. Using well detailed calculations and appropriate sketches of the building under consideration, calculate the rate of heat loss of the building. **(15 Marks).**

(c ) A drawing office is 10 x 8m$^2$ and 3m high. One long and one short walls are external. The long wall faces the east direction and it contains 5m$^2$ of open window. The short wall faces the south and it contains 4m$^2$ of open window. The walls are 225mm solid brick wall with 18mm plaster applies internally and externally. The internal temperature is $29^0$C while the air temperature is $34^0$C. The ventilation rate is 8 air changes per hour.

Solar intensity of the east facing wall is 750W/m$^2$ and that of the south facing wall is 220W/m$^2$. The internal surface resistance is 0.123m$^2$ $^0$C/W and the external surface resistance is 0.053m$^2$ $^0$C/W. Absorptivity of the wall surface is 0.6. Thermal conductivities for brick wall and plaster are 1.20 and 0.48 respectively. Surface conductance (external) is 20.50W/m$^2$ $^0$C and surface conductance (internal) is 8.20W/m$^2$ $^0$C. Ignore radiative heat process in the construction and heat flow process of the drawing

Calculate the following:
(1) Thermal transmittance (U-Value) of the brick wall.
(2) Total heat gained into the drawing office.
(3) Give reasons why the radiative heat was ignored.

Note: Considerations will be given to well-stated calculations and well-detailed sketches.

**(30 Marks).**

2a(i) Briefly define the following terms:
(i) Daylighting (ii) Daylight Factor **(4 Marks)**
(ii) Using well-labelled diagrams, write briefly on the components of daylight factor. **(6 Marks)**

(iii) Explain any **5 functions** of daylighting in buildings. **(10 Marks)**

(iv) State any 4 parameters related to window that must be established in calculating daylighting in buildings. **(2 Marks)**
(v) Explain the sequential processes involved in the use of Lumen Design Method. **(10 Marks)**

(b) State the illumination level (lux) required for visual comfort in the following types of building spaces:
(i) Offices (General) (ii) Drawing offices (iii) Shops (General) (iv) Living rooms (v) Reading rooms **(5 Marks)**

## PART B

3(a) Explain the modes of sound transmission in buildings. **(12 Marks)**

(b) Explain the contributory roles of behaviour of building materials in indoor acoustical(sound) performance. **(8 Marks)**

4(a) Write briefly on the patterns of construction by the following people:
(i) Babylonians (ii) Greek (iii) Assyrians (iv) Egyptians **(12 Marks)**

(b) Using relevant and well-labelled graphical illustrations, discuss the concept and issues associated with psychrometry. **(8 Marks)**

OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE
FACULTY OF ENVIRONMENTAL DESIGN AND MANAGEMENT
DEPARTMENT OF BUILDING
HARMATTAN SEMESTER EXAMINATION 2018/2019 SESSION

**BLD 205: BUILDING AND ARCHITECTURAL SCIENCE**
**B.Sc. Building and Quantity Surveying** **July 2019**

**INSTRUCTIONS: Answer ALL Questions in PART A and ANY Other Question in PART B.**
**TIME ALLOWED: 2HOURS**

## PART A

1a(i) Discuss using illustrations and appropriate sketches, the applications of active and passive mechanisms in ensuring comfort drive in buildings. **(25 Marks)**

(ii) You have been commissioned to design and construct 500 building units in Port Harcourt. Write briefly on the comfort indicators you would consider during the design and construction of the building stock. **(10 Marks)**

1b(i) Using relevant examples and illustrations, distinguish between direct and indirect sources of noise. **(10 Marks)**

(ii) How would you enhance acoustical performance of a studio room to be used in a new radio station to be established in Ile-Ife taking into note its design and materials of construction. **(10 Marks)**

2a Explain the following terms:
(i) Thermal comfort (ii) Thermal discomfort (iii) Thermal stress **(9 Marks)**

(ii) Using relevant mathematical expressions and illustrations, write briefly on the types of temperatures to be considered in achieving thermal comfort needs of building occupants. **(15 Marks)**

3 Explain using practical examples, cases where mechanical ventilation may be required in a building.

## PART B

3(i) Explain the various forms of primary and secondary purposes of lighting in buildings. **(10 Marks)**

(ii) Write on the use of Lumen Design Method of Electric Lighting in buildings. **(8 Marks)**

4(i) Write briefly on the historical perspective of provision of shelter across places and civilizations. **(12 Marks)**

(ii) Distinguish between micro climate and macro climate elements of the built environment. **(6 Marks)**

**OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE**
**FACULTY OF ENVIRONMENTAL DESIGN AND MANAGEMENT**
**DEPARTMENT OF BUILDING**
**HARMATTAN SEMESTER EXAMINATION 2017/2018 SESSION**

**BLD 205: BUILDING AND ARCHITECTURAL SCIENCE**
**B.Sc. Building and Quantity Surveying** **August 2018**

**INSTRUCTIONS: Answer ALL Questions in PART A and ANY Other Question in PART B.**
**TIME ALLOWED: 2HOURS**

## PART A

1(i) Briefly explain the term called built environment. (5 Marks)

(ii) Explain the contributions of the Egyptians to the evolution of buildings. (5 Marks)

(iii) Using relevant examples that may exist in temperate and tropical environments, explain how buildings act as environmental filter. (10 Marks)

2 (i) List and explain four (4) comfort mandates that buildings must be able to deliver in order to allow its occupants be able to perform tasks indoor productively. (20 Marks)

(ii) Differentiate between the use of active and passive means in achieving comfort in buildings. (10 Marks)

(iii) The continuous exposure of building occupants to mechanical ventilation and air-conditioning system can cause associated health effects such as:

(a) Sick building syndrome, (b) Humidifier fever, (c ) Legionnaire's disease

Briefly explain each of them. (15 Marks)

3(i) When do cases of hypothermia and hyperthermia occur to building occupants? (9 Marks)

(ii) Explain three modes of heat transfer in buildings. (12 Marks)

**PART B**

4(i) Explain the use of Lumen Design Formula in Lighting Design of Buildings. (10 Marks)

(ii) Explain two sources of lighting in buildings. (10 Marks)

5(i) Define the concept called sound. (4 Marks)

(ii) Differentiate between noise and sound. (6 Marks)

(iii) Using relevant diagrams, explain the modes of sound transmission in buildings. (10 Marks)

# OBAFEMI AWOLOWO UNIVERSITY
# ILE-IFE

RAIN SEMESTER EXAMINATION 2019/2020 SESSION

FACULTY OF ENVIRONMENTAL DESIGN AND MANAGEMENT
DEPARTMENT OF BUILDING

B.Sc. Building

September, 2021

BLD 208: BUSINESS ORGANISATION AND ACCOUNT

INSTRUCTIONS

TIME ALLOWED: 2HOURS

(Answer Question **ONE** and **THREE** other Questions)
Calculations should be clearly shown.

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Registration Number:.....

Name:.....

Department:.....

## QUESTION ONE

From the following trial balance of GODFRAN PLC, draw up a Trading, profit and loss Account for the year ended 31st December, 2012 and a balance sheet as at that date.

| Particulars | Dr (₦) | Cr (₦) |
|---|---|---|
| Sale | | 837,000 |
| Purchases | 520,020 | |
| Stock 1/1/2012 | 169,920 | |
| Carriage outwards | 14,940 | |
| Carriage inwards | 10,530 | |
| Return inwards | 19,800 | |

| | | |
|---|---|---|
| Return outwards | | 15,975 |
| Salaries and wages | 110,115 | |
| Motor Expenses | 29,880 | |
| Rent | 25,920 | |
| Sundry Expenses | 54,090 | |
| Motor vehicle | 108,000 | |
| Fixtures and fittings | 27,000 | |
| Debtors | 205,965 | |
| Creditors | | 137,025 |
| Cash at Bank | 174,420 | |
| Cash in hand | 5,400 | |
| Drawings | 91,980 | |
| Capital | | 577,980 |
| Total | **1,567,980** | **1,567,980** |

Stock at 31st December, 2012 was ₦224, 910

**Question Two**

(a) Discuss five features of financial accounting.
(b) Mention five users of financial statement and discuss the reasons why such information is needed.
(c) Enumerate five types of errors not affecting the trial balance

**Question Three**

(a) Enter the following transactions in a two-column cash book and balance off as at the end of the month:

Jan. 1 Started business with ₦300,000 in cash
Jan. 2 Paid rent by cash ₦30,000
Jan. 3. Received loan by cheque from Lizzy ₦1,500,000
Jan. 4 Paid Peter by cheque ₦195,000
Jan. 5 Cash sales ₦294,000
Jan. 7. Received from Paul by cheque ₦186,000
Jan. 9. Paid Momoh in cash ₦66,000
Jan. 11 Cash sales paid direct into the bank ₦159,000
Jan. 15 Paid Tozi in cash ₦325,000
Jan. 16 Paid cash into bank 150,000
Jan. 19 Paid Lizzy ₦300,000 by cheque
Jan. 22. Cash sales paid direct into the bank ₦198,000
Jan. 26 Paid motor expenses by cheque ₦36,000
Jan. 30 Withdrew ₦300,000 cash from the bank for business use
Jan. 31 Paid wages in cash ₦291,,000

(b) Make the necessary accounting entries to record the following credit sales made by Mathew during the month of May 2010.

May 1 Sold 20 creates of minerals to Tessy at the rate of ₦900 each less 5% trade discount.
May 8 Sold 40 cartons of toilet rolls @ 500 each less 10% trade discount to Aliyu.
May 13 Sold 20 packet of sugar to Lucy at ₦120 each
May 20 Sold 30 cartons of Eva water to Blesssing at ₦1000 each less 5% trade discount

May 22 The goods worth ₦14,400 sold to blessing were returned.

**Question Four**

Prepare the necessary accounts for the month of August, 2014 for Better Change Limited from the following information and extract a trial balance.

Aug. 1. Started business with cash of N200,000
Aug. 3. Bought goods on credit from D. King N54,000; Mr.KamaraN87,000 and R. A. AkintoyeN25,000
Aug. 4. Paid rent by cash N12,000
Aug. 6. Sold goods on credit to Flamingo N43,000; Bose N62,000 and Tony N170,000
Aug. 10. Flamingo paid by cheque N42,000
Aug. 12. Tony paid cash of N166,500
Aug. 21. Sold goods on credit to Bose N60,200
Aug. 24. Bought goods by cash N18,715
Aug. 26. Cash sales N46,148
Aug. 28. Bought goods on credit from Mr.Kamaraworth N28,950
Aug. 30. Paid salary by cheque N7,250
Aug. 31. Withdrew cash of N5,000 for personal use
Aug. 31 Withdrew N30,000 from bank for office use.
Aug. 31. Paid Mr.KamaraN82,750 by cash

**Question Five**

Write short notes on the following:
(a)Partnership form of business
(b)Shares
(c)Debentures

DEPARTMENT OF BUILDING
OBAFEMI AWOLOWO UNIVERSITY ILE-IFE
BLD 201 – BUILDING CONSTRUCTION AND MATERIALS I
HARMATTAN SEMESTER EXAMINATION, 2018/2019 SESSION

**Instructions:**

- Answer Question 1 and two other questions.
- Mark will be awarded for title block, border lines and neat sketches presentation
- **Time allowed:** 120 minutes

QUESTION 1a

A typical rectangular column (450mm× 225mm) exerts a load of 675KN on a soil with a bearing capacity of 150KN/$M^2$.

(i) If the shorter side of the base is 1.5m, calculate the longer side and the base area (rectangular) adequate for the column, (5 points)

(ii) Produce the plan and sectional details (scale 1:20) of the foundation assuming that the column base is 300mm thick, ground level is 1500mm above the top of the column base and at your level referred to the column as 'reinforced column' and base as 'reinforced column base' (2×12.5=25 points)

1b. Produce neat and detailed sectional sketches of the following foundation types;

(a) combined pad (b) cellular raft (c) beam and slab raft (d) solid raft

(d) grillage pad (e) shallow strip (5×6=30 points)

QUESTION 2

Given the following information.

- Length of a classroom (in to in) =8,000mm
- Breadth of a classroom(in to in) = 6,000mm
- 4 no square pad footings (1200mm × 1200mm) at the corners
- Block wall thickness = 225mm
- Foundation width = 675mm
- Column size = 230mm × 230mm
- Concrete in foundation thickness = 225mm
- Height of block wall from top of foundation to underneath ground floor slab = 1100mm
- Floor slab = 150mm thick
- Hardcore = 250mm thick, laid on compacted earth fill
- Ground floor level is 450mm below the surface of the floor slab

**DEPARTMENT OF BUILDING**
**OBAFEMI AWOLOWO UNIVERSITY ILE-IFE**
**BLD 201 – BUILDING CONSTRUCTION AND MATERIALS I**
**HARMATTAN SEMESTER EXAMINATION, 2017/2018 SESSION**

**Instructions:**

- Answer Question 1 and two other questions.
- Mark will be awarded for title block, border lines and neat sketches presentation
- **Time allowed:** 145minutes

## QUESTION 1

(a) Produce a typical **plan** and **sectional diagrams** (Scale 1:50) of a setting out process for a corner (6000mm × 6000mm) of a building using the following information;

- Width of excavation = 675mm
- Depth of excavation = 900mm
- Corner profiles are 1200mm away from excavation
- Profile pegs are 50mm × 75mm × 1000mm high @ 1000mm centers
- Profile boards are 25mm thick × 75mm high × 3600mm long
- Wall thickness = 225mm
- Foundation spread = 225mm (15×2=30 points)

(b) Produce a **pictorial view** (Scale 1:50) of the corner profile assuming the pegs are driven 300mm into the soil and the profile boards are nailed to flush with the tip of the pegs. (10 × 3 = 30 points)

## QUESTION 2

Given the following information.

- Length of a classroom (in to in) =12,000mm
- Breadth of a classroom(in to in) = 9,000mm
- Block wall thickness = 225mm
- Foundation width = 900mm
- Concrete in foundation thickness = 225mm
- Height of block wall from top of foundation to underneath ground floor slab = 1100mm
- Floor slab = 150mm thick
- Hardcore = 250mm thick, laid on compacted earth fill
- Ground floor level is 450mm below the surface of the floor slab

Based on the above information,

- Produce a typical **foundation plan** of the room to scale 1:100 (15 points)
- Produce a **sectional view** (Scale 1:50) (10 points)
- What type of foundation is this (with a reason)? (5 points)

QUESTION 3

Produce neat and detail sectional sketches of the following foundation types; combined pad, cellular raft, beam and slab raft, solid raft, grillage pad and shallow strip (5×6=30 points)

QUESTION 4

A typical column (225mm× 225mm) exert a load of 450KN on a soil with a bearing capacity of 150KN/$M^2$.

(i) Calculate the base area adequate for the column (5 points)

(ii) Produce the plan and sectional details (scale 1:20) of the foundation assuming that the column base is 300mm thick, ground level is 1500mm above the top of the column base and at your level referred to the column as 'reinforced column' and base as 'reinforced column base' (2×12.5=25 points)

## BLD 201, 2017/ 2018 HARMATTAN SEMESTER

### QUESTION 5

i. Produce an oblique view of a 225×225×450mm hollow sandcrete block (scale 1:10) assume the hollow sections are 100mm ×100mm. Make reasonable assumptions for other details of the block. (15 points)

ii. Produce a neat sketch of a typical slump cone (mould) .... (5 points)

iii. Describe with two sketches (only) the method of measuring slump... (10 points)

# OBAFEMI AWOLOWO UNIVERSITY
## ILE-IFE


## HARMATTAN SEMESTER EXAMINATION 2012/2013 SESSION

FACULTY OF ENVIRONMENTAL DESIGN AND MANAGEMENT

DEPARTMENT OF BUILDING

*B.Sc. Building , Estate Management, Quantity Surveying and Urban and Regional Planning*

*JUNE 2013*

BLD 201: BUILDING CONSTRUCTION AND MATERIALS I

INSTRUCTIONS

*Answer QUESTIONS 1, 2 and one other question*

*TIME ALLOWED: 2HOURS*

QUESTION 1

A typical foundation is loaded as follows:

- Sub structural block wall = 225mm × 225mm ×450mm, 1500mm high with a density of 2400kg/$m^3$.
- Super structural block wall = 225mm × 225mm × 450mm, 3800mm high with a density of 2400kg/$m^3$,
- Roof construction and covering = 15.5KN/m length of wall.
- Plastering and finishes = 12KN/m length of wall.
- Floor slab = 13.5KN/m length of wall.
- Self weight of concrete in foundation = 4,5KN/m length of wall.

Using the above information;

(i) Estimate the total load on the soil. **(5 marks)**

**(ii)** If the bearing capacity of the soil is 82.36KN/$m^2$, estimate the base area and width of the foundation required to transmit the load effectively on the soil. **(10 marks)**

(iii) Produce a typical foundation plan details to **scale 1:10. (10marks)**

(iv) Produce a typical sectional details (up to the ground floor slab) to **scale 1:20** assuming the following information;

- 300mm thick earth filling
- 250mm thick hardcore
- 150mm thick oversite concrete.
- Natural ground level is 300mm lower than the top of the oversite concrete. **(15marks)**

**QUESTION2.**

(a) Produce a typical corner profile **(scale 1:15)** in isometric format as per the following information;
- 3no.50mm×50mm pegs, 1000mm above ground level.
- 2no. profile boards 25mm×100mm,2500mm long.**(20 marks)**

(b) Locate the positions of a trench size 1200mm×1200mm of a column base supporting a column size 225mm×225mm, on the profile boards. **(10 marks)**

(c) Produce the activities in questions 1a and 1b on plan (scale 1:15) **(20 marks)**

(d) What type of foundation is being set out on the profile as presented above? **(5 marks)**

**QUESTION3.**

(a) Produce a floor plan **(scale 1:50)** of a classroom building to the following specification.
- Length (in to in of block wall) =7500mm.

- Breadth (in to in of block wall) = 4500mm.
- Block wall thickness = 225mm. **(15 marks)**

(b) If the classroom is to be built on a solid raft footing; produce a sectional diagram (along 4500mm direction) to the following specification; **(scale 1:30)**

- 200mm thick raft floor slab reinforced with 6mm thick BRC wire mesh positioned 150mm below the slab surface.
- 200mm thick hardcore laid below the floor slab.
- The floor is thickened with perimeter ground beam 450mm thick and 400mm wide spanning underneath the block walls.
- Natural ground level is 350mm below the surface of the floor slab. **(25 marks)**

**QUESTION 4**

Produce a typical 225mm×225mm×450mmhollow sandcrete block **(scale 1:8)** in

(i) Isometric view **(20 marks)** and;
(ii) Oblique view.**(20 marks)**

Assume that the hollow sections are 100mm×100mm.

# OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE

FACULTY OF ENVIRONMENTAL DESIGN AND MANAGEMENT
DEPARTMENT OF BUILDING

## HARMATTAN SEMESTER EXAMINATION 2021/2022 SESSION

JANUARY 2023

BLD 203: - STRUCTURAL MECHANICS AND STRENGTH OF MATERIALS I

B.Sc. Building, Architecture and Quantity Surveying

INSTRUCTIONS
Answer Questions 1, 2, 3 and ANY other question: FOUR questions in all.

TIME ALLOWED: 3Hours

**Question One**

(a) By using the method of joint, analyse the truss in Fig.Q1a below.

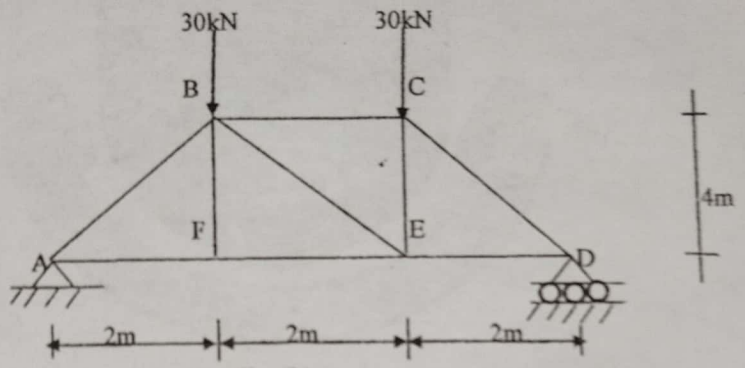



Fig. Q1a

(b) Solve for $\mathbf{F_1}$ and $\mathbf{F_2}$ if the system of forces shown in Fig.Q1b is in equilibrium.

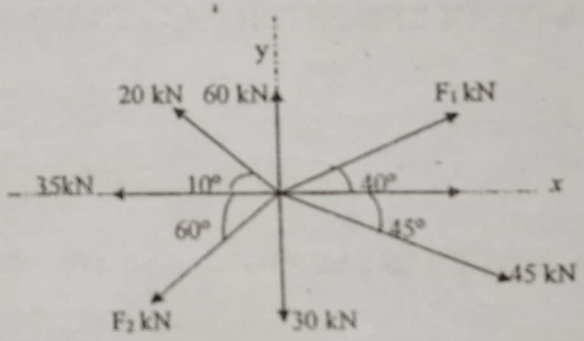



Fig. Q1b

**Question Two**

(a) The following results were obtained in a tensile test on a mild steel specimen of original diameter 2cm and gauge length 4cm. At the limit of proportionality the load was 80000N and the extension was 0.048mm. The specimen yielded at a load of 85000N and the maximum load withstood was 150,000N. When the two portions were fitted together after being broken, the length between the gauge point was found to be 5.56cm and the diameter at the neck was 1.58cm. Calculate Young's modulus and the stress at the limit of proportionality, the yield stress and ultimate tensile stress also the percentage elongation and contraction.

(b) A tensile test is carried out on a bar of mild steel of diameter 2cm, the bar yields under a load of 80kN. It reaches a maximum load of 150kN and breaks finally at a load of 70kN. Estimate:

(i) the tensile stress at the yield point

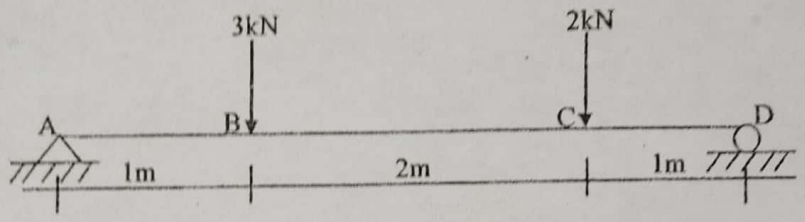
(ii) the ultimate tensile stress

(iii)the average stress at the breaking point if the diameter of the fracture neck is 1cm

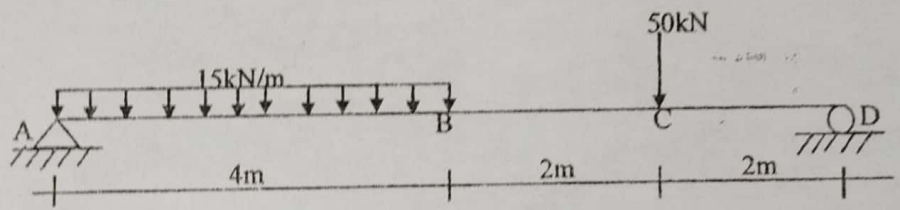
**Question Three**

For the beams shown below calculate the reactions and sketch the shear force and bending moment diagrams.

(a)




(b)




**Question Four**

A reinforced concrete column 450 mm x 450 mm has four steel rods of 30 mm diameter embedded in it. Find the stresses in steel and concrete when the total load on the column is 1500 kN. Compute the maximum safe load P that may be applied if the allowable stresses in steel and concrete are 140 $N/mm^2$ and 5 $N/mm^2$ respectively. Take E for steel and concrete as 208 $N/mm^2$ and 15.6 $N/mm^2$ respectively.

**Question Five**

A mild steel rod of 30 mm diameter and 400 mm long is encased centrally inside a hollow copper tube of external diameter 40 mm and inside diameter 35 mm. The ends of the rod and tube are rigidly attached and the composite bar is subjected to an axial pull of 45 kN. If E for steel and copper are 200 $GN/m^2$ and 100 $GN/m^2$ respectively, find the stress developed in the rod and the tube. Find also the extension of the rod.

OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE
FACULTY OF ENVIRONMENTAL DESIGN AND MANAGEMENT
DEPARTMENT OF BUILDING

2018/2019 HARMATTAN SEMESTER EXAMINATION

**BLD 203: STRUCTURAL MECHANICS AND STRENGTHS OF MATERIALS I**
**B.Sc. Building, Architecture and Quantity Surveying** **Time allowed:** 3 hrs
Instruction: Answer Questions **1, 2** and any other **one** questions **(3 questions in all)**

## Question One

**(a)** Distinguish between isostatic, hyperstatic and hypostatic structures. Use a simple beam in each case to illustrate your answer.
**(b)** State four methods for the analysis of trusses.
**(c)** State the principle of transmissibility.
**(d)** For the beam shown in **Fig. Q1d**, determine the support reactions and draw the shear force and bending moment diagrams, indicating the positions of contraflexure and the maximum bending moment.

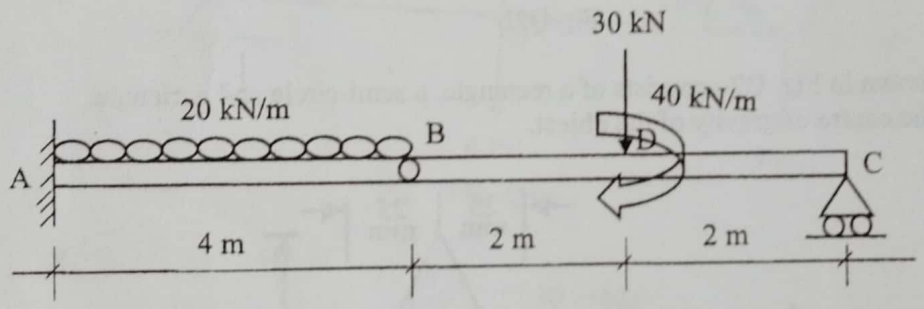



**Fig. Q1d**

**(e)** The bar shown in **Fig. Q1e** is subjected to a tensile force of 200 kN at each end. Find the
(i) diameter of middle portion if the stress in the middle portion is limited to 150 N/mm$^2$
(ii) length of the individual portions if the total elongation of the bar is limited to 0.30 mm. Take E = 200kN/mm$^2$.

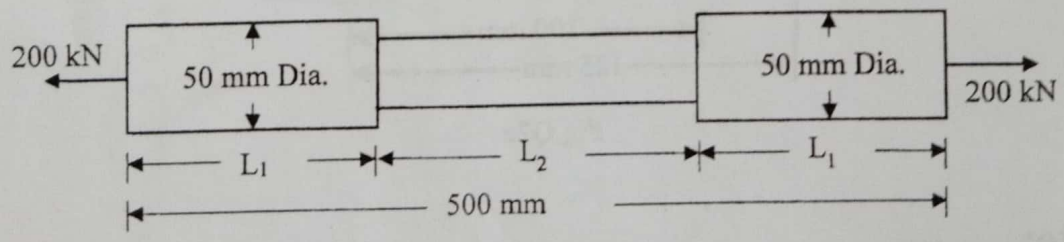



**Fig. Q1e**

## Question Two

(a) A bar of steel, having a rectangular cross-section 7.5 cm by 2.5 cm, carries an axial tensile load of 180 kN. Estimate the decrease in the length of the sides of the cross-section if Young's modulus, E, is 200 GN/m$^2$ and Poisson's ratio, $\nu$, is 0.3.

(b) A semi-circular area is removed from a trapezium as shown in Fig.Q2b. Determine the centroid of the remaining area. All dimensions are in mm.

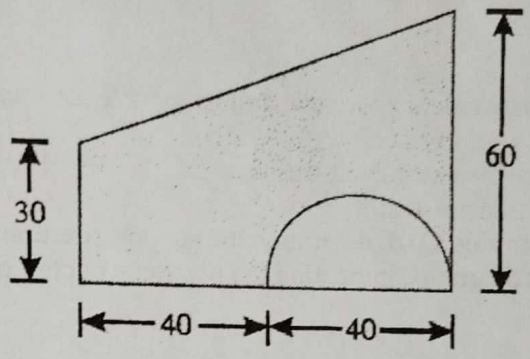



**Fig Q2b**

(c) The object shown in Fig. Q2c consists of a rectangle, a semi-circle and a triangle. Determine the centre of gravity of the object.

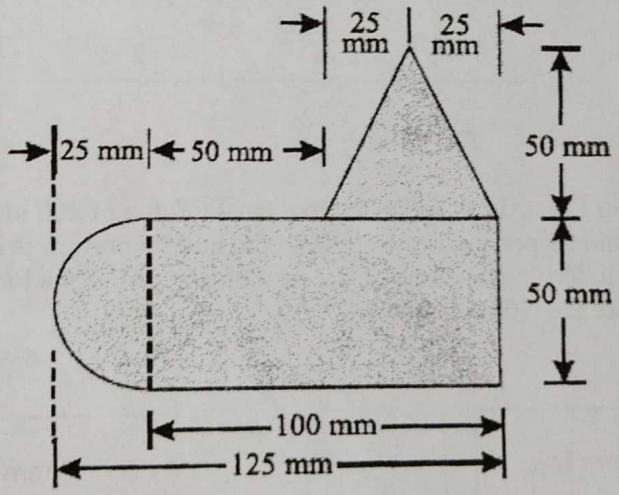
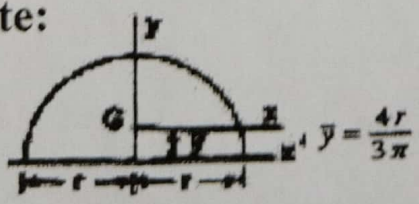



**Fig Q2c**

**Note:**



## Question Three

(a) Analyse the truss shown in **Fig. Q3a** using method of joints.
(b) Determine the support reactions of the frame shown in **Fig. Q3b.**

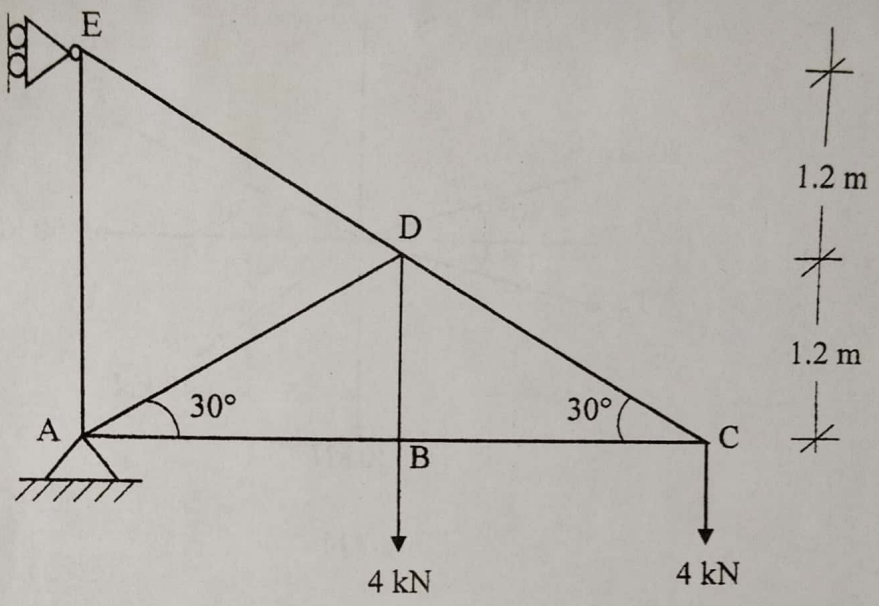



**Fig. Q3a**

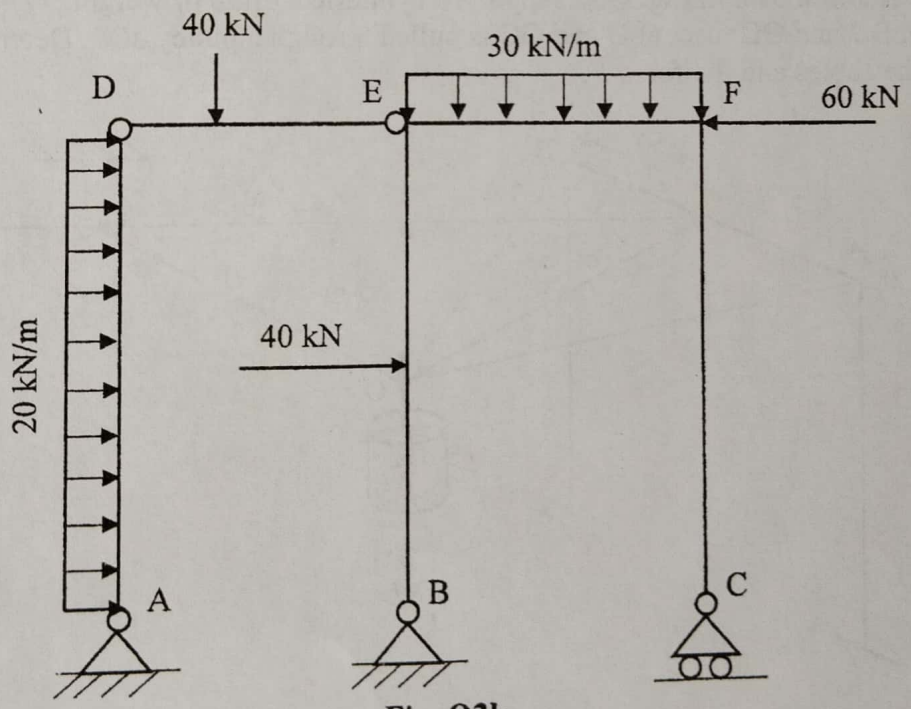



**Fig. Q3b**

## Question Four

(a) A beam ABCD is 24 m long and is simply supported at B and D, 18 m apart. A concentrated load of 20 kN at A and a total distributed load of 120 kN, which varies linearly from **p** kN/m

at the centre C to **q** kN/m at D is spread from C to D. Find the values of **p** and **q** for the reactions at B and D to be equal. Find also the point of contraflexure and the position and magnitude of the maximum bending moment.

**(b)** Solve for $F_1$ and $F_2$ if the system of forces shown in **Fig. 4b** are in equilibrium.

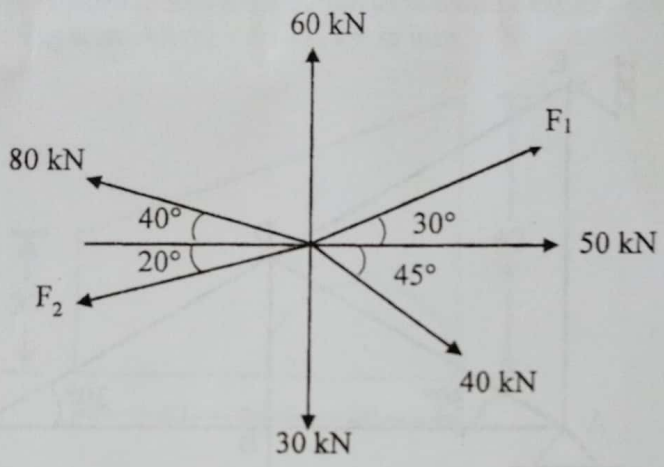



**Fig. Q4b**

**Question Five**

**(a)** The frame shown in **Fig. Q5a** supports a cylindrical drum of weight, **W** = 100 kg as cables AO, BO and OC meet at O and OC is pulled through a pulley at C. Determine the tension in the cables and the force $\bar{F}$.

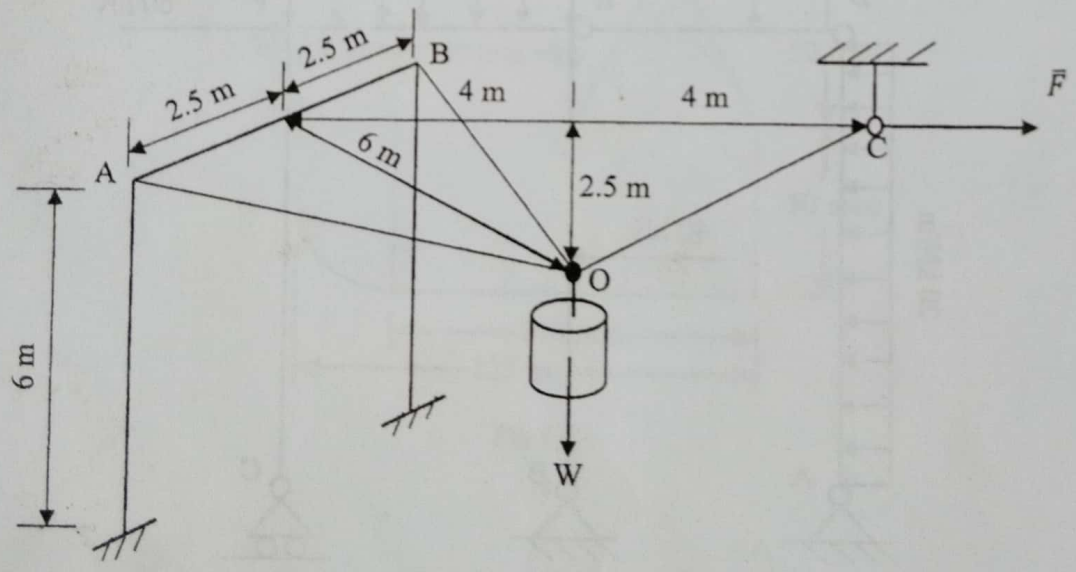



**Fig. Q5a**

**(b)** (i) Define what you understand by the term "structural mechanics".
(ii) What are the 3 characteristics of a force?
(iii) Mention 3 types of force systems you know.
(iv) What are forces said to be equivalent?