



FEDERAL UNIVERSITY OYE-EKITI
B.Eng. (Civil Engineering) Degree Examination
Second Semester 2019/2020 Session
CVE 204: Strength of Materials I:

2 Units

August 2021

Time Allowed: 2½Hrs

Instruction: Answer two questions each from both Sections A and B.

Section A

Question 1 (25 marks)

- A) i. What do you understand by the following terms: Elasticity, Stress, Strain, Young's modulus? (4 marks)
ii Distinguish diagrammatically, giving due explanation between the concept of tensile stress, compressive stress and their corresponding strains. (6 marks)
- B) A compound tube consists of a steel tube 140 mm internal diameter and 160 mm external diameter and an outer brass tube 160 mm internal diameter and 180 mm external diameter. The two tubes are of the same length. The compound tube carries an axial load of 900 kN. Find the stresses and the load carried by each tube and the amount it shortens. Length of each tube is 140 mm. Take E for steel as $2 \times 10^5 \text{ N/mm}^2$ and for brass as $1 \times 10^5 \text{ N/mm}^2$ was conducted on a mild steel bar. (15 marks)

Question 2 (25 marks)

- A) Define a composite bar. How will you find the stresses and load carried by each member of a composite bar? (5 marks)
- B) An axial pull of 35000 N is acting on a bar consisting of three lengths as shown in Figure 1. If the Young's modulus = $2.1 \times 10^5 \text{ N/mm}^2$. Determine: (i) Stresses in each section and (ii) total extension of the bar. (20 marks)

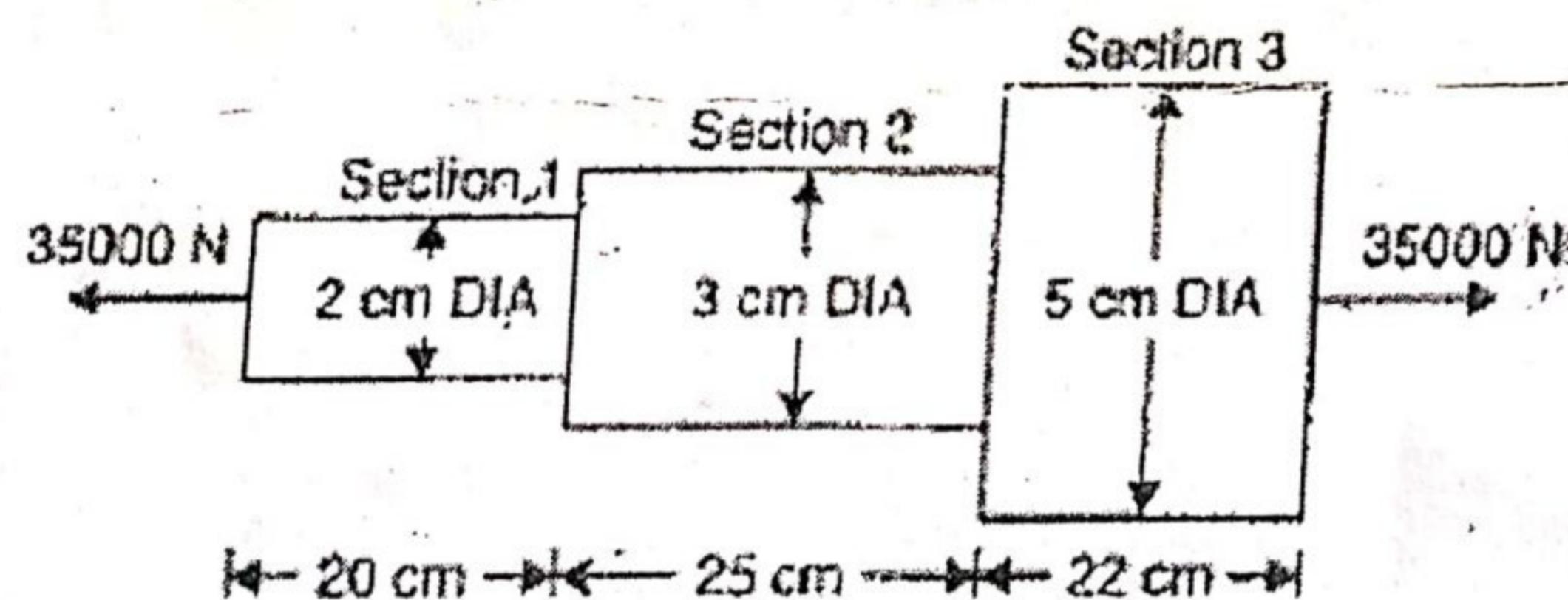


Fig 1

Question 3 (25 marks)

- A) Define modular ratio, tensile stresses, thermal stresses, thermal strains, and Poisson's ratio. (5 marks)
- B) (i) The safe stress, for a hollow steel column which carries an axial load of $2.1 \times 10^3 \text{ kN}$ is 125 MN/m^2 . If the external diameter is 30 cm, determine the internal diameter. (10 marks)
- (ii) The ultimate stress, for a hollow steel column which carries an axial load of 1.9 MN is 480 N/mm^2 . If the external diameter of the column is 200 mm, determine the internal diameter. Take the factor of safety as 4. (10 marks)

Section B

Question 4 (25 marks)

A) Define the following terms: (i) Shear force, (ii) Shear force diagram, (iii) Bending moment, (iv) Bending moment diagrams, (v) Cantilever beam. (5 marks)

B) A cantilever beam of length 2 m carries the uniformly distributed load of 1 kN/m run over a length of 1.5 m. Draw the shear force and bending moment diagrams for the cantilever beam. (20 marks)

Question 5 (25 marks)

A) What are the different types of loads acting on a beam? (5 marks)

B) A simply supported beam of length 10 m shown in Figure 2, draw the Shear force diagram (SFD) and bending moment diagram (BMD) for the beam, find the magnitude and location of maximum bending moment. (20 marks)

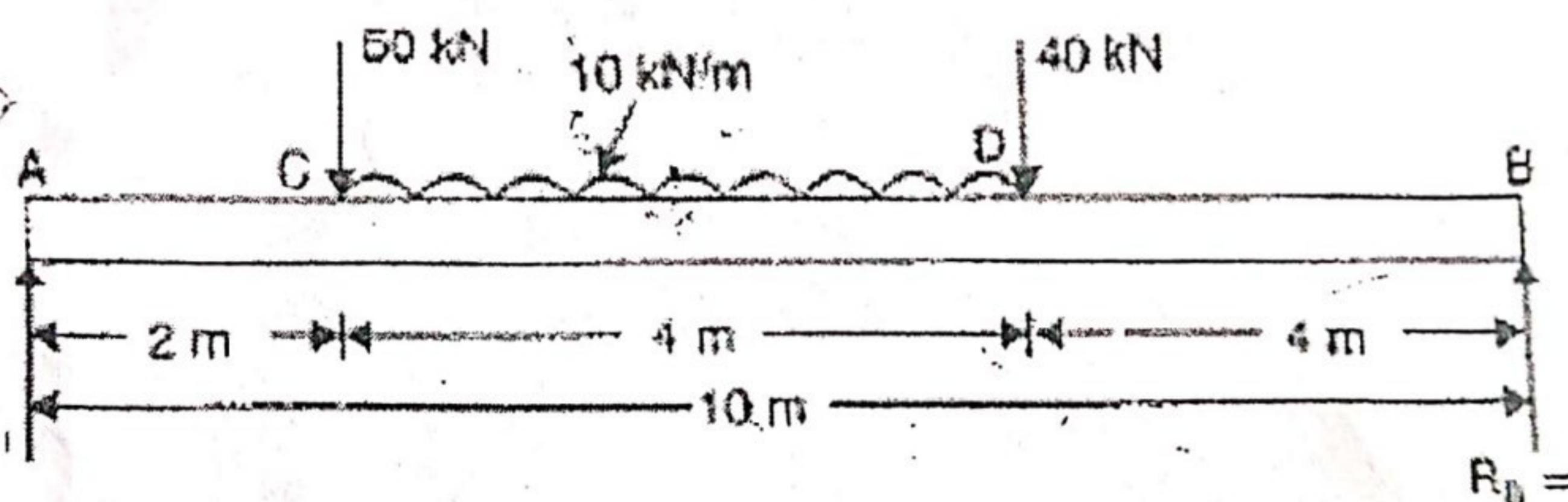


Figure. 2

Question 6 (25 marks)

A) Diagrammatically, list the various types of support in Civil Engineering structures. (10 marks)

B) Calculate the reactions at A and B for the beam subjected to a concentrated load as shown in Figure 3, then draw the S.F. and B.M. diagrams. (15 marks)

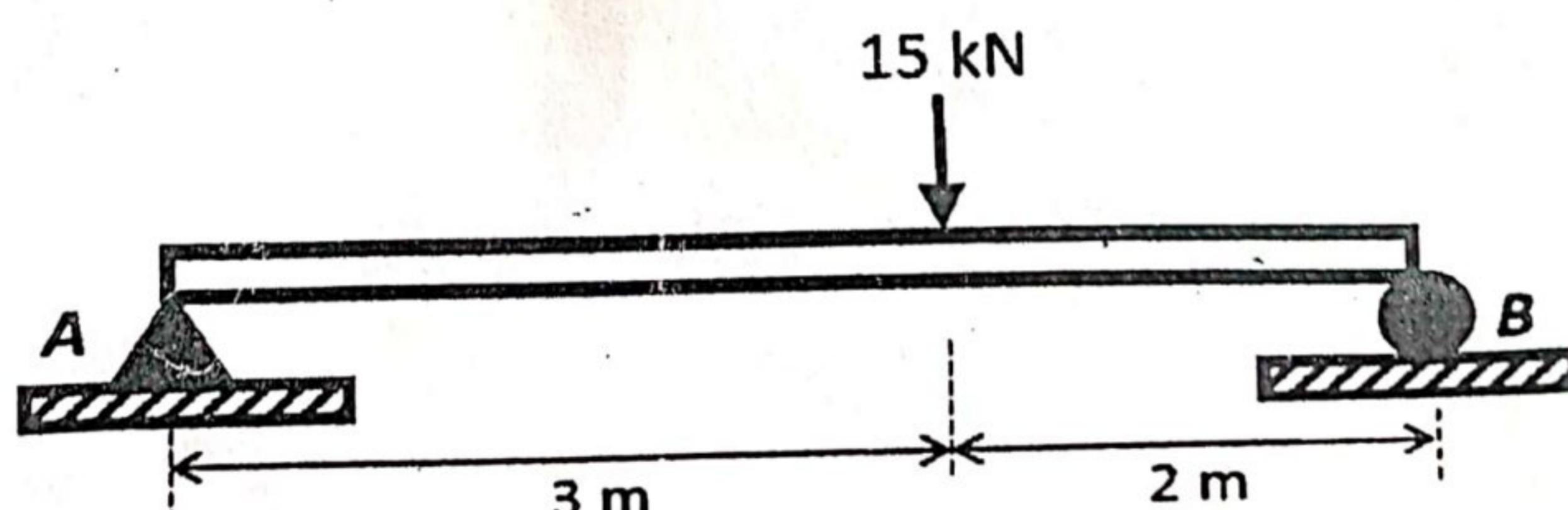


Figure 3



FEDERAL UNIVERSITY OYE-EKITI

B.Eng. (Civil Engineering) Degree Examination
Second Semester 2020/2021 Session

CVE 204: Strength of Materials I: 2 Units

November 2022

Time Allowed: 2½Hrs

Instruction: Answer two questions each from both Sections A and B.

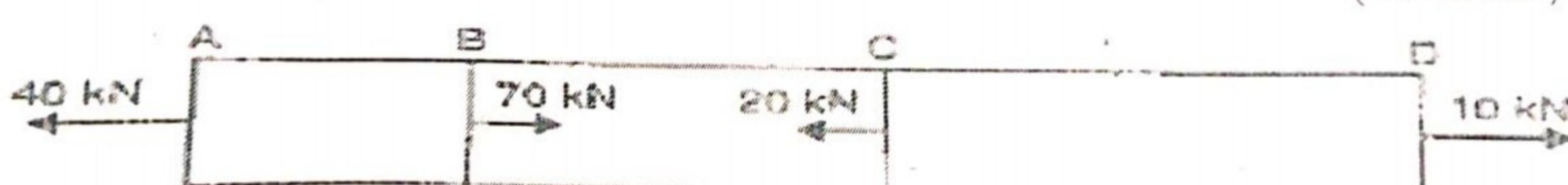
SECTION A

Question 1 (25 marks)

- A) i. In simple stresses and strains analysis, show that the deformation “ δl ” of a body due to force acting on it is given as, $\delta l = \frac{Pl}{AE}$, where P = load acting on the body; l = length of the body, A = Cross-sectional area of the body, and E = Modulus of elasticity for the material of the body. (10marks)
ii Distinguish diagrammatically, giving due explanation between the concept of tensile stress, compressive stress and their corresponding strains. (5 marks)
B) A hollow cylinder 2 m long has an outside diameter of 50 mm and inside diameter of 30 mm. If the cylinder is carrying load of 25 kN, find the stress in the cylinder. Also find the deformation of the cylinder, if the value of modulus of elasticity for the cylinder material is 100 GPa. (10 marks)

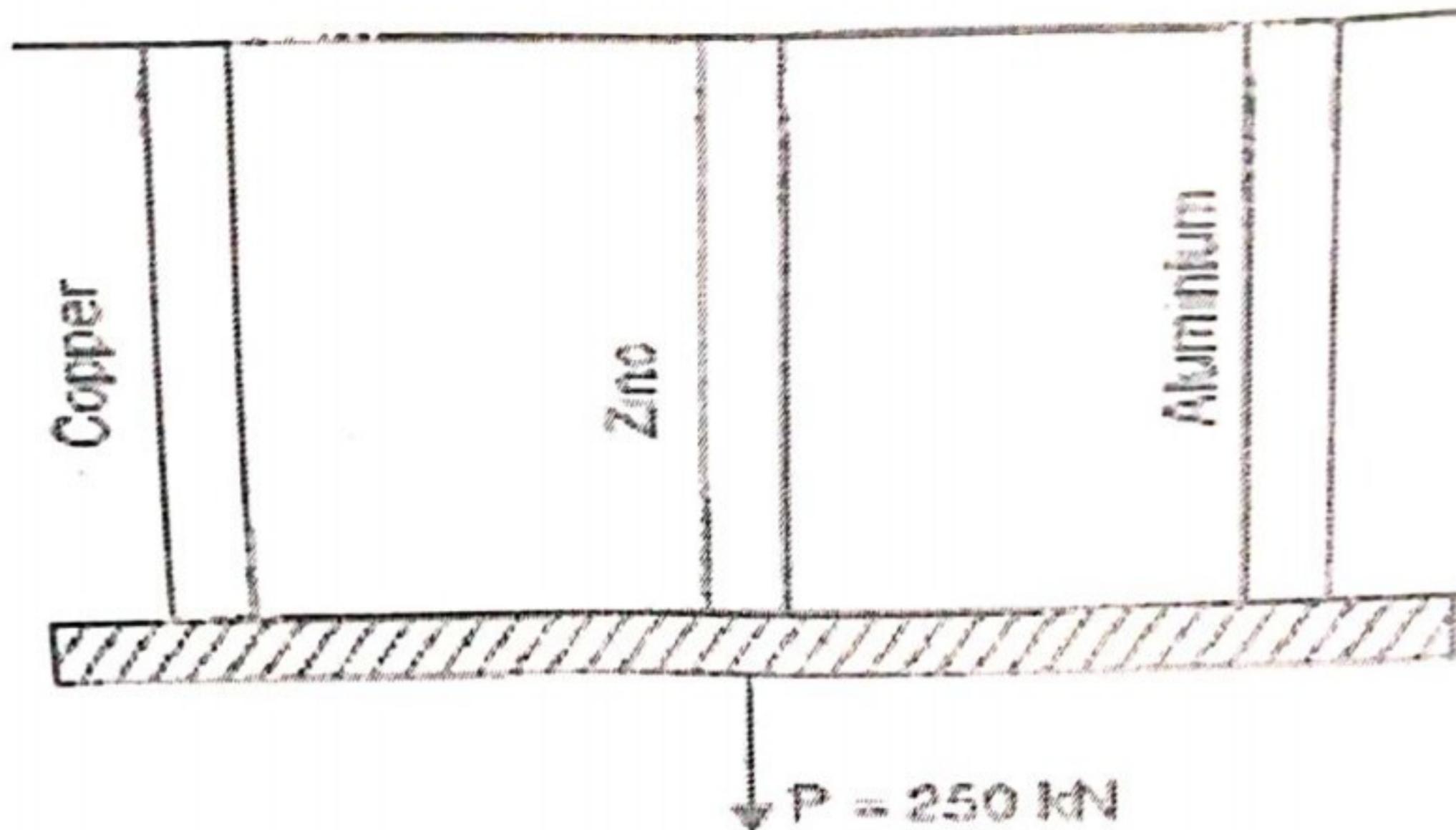
Question 2 (25 marks)

- A) i. Define a composite bar. How will you find the stresses and load carried by each member of a composite bar? (5 marks)
ii. A steel rod of 3cm diameter and 5m long is connected to two grips and the rod is maintained at a temperature of 95° C. Determine the stress and pull exerted when the temperature falls to 30° C, if (i) the ends do not yield, and (ii) the ends yield by 0.12 cm. Take $E = 2 \times 10^5 \text{ MN/m}^2$ and $\alpha = 12 \times 10^{-6}/\text{C}$. (10 marks)
B) A brass bar having cross-section area of 1200 mm² is subjected to an axial force as shown below in which AB = 0.8m, BC = 1.2m and CD = 1.4m. Find the total elongation of the bar take $E = 1 \times 10^5 \text{ N/mm}^2$. (10 marks)



Question 3 (25 marks)

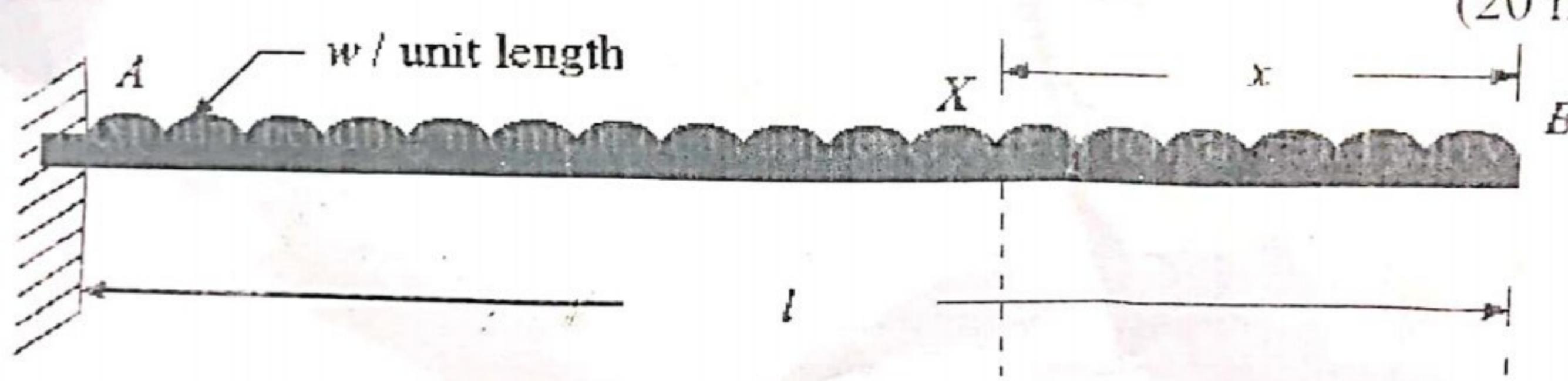
- A) Define modular ratio, tensile stresses, thermal stresses, thermal strains, and Poisson's ratio. (5 marks)
B) Three bars made of copper, zinc and aluminum are of equal length and cross-section 500, 750 and 1000 square mm respectively. They are rigidly connected at their ends as shown below, the compound member is subjected to a longitudinal pull of 250 kN, estimate the proportional of the load carried on each rod and the induced stresses. Take the value of E for copper = $1.3 \times 10^5 \text{ N/mm}^2$, for zinc = $1.0 \times 10^5 \text{ N/mm}^2$ and for aluminum = $0.8 \times 10^5 \text{ N/mm}^2$. (20 marks)



SECTION B

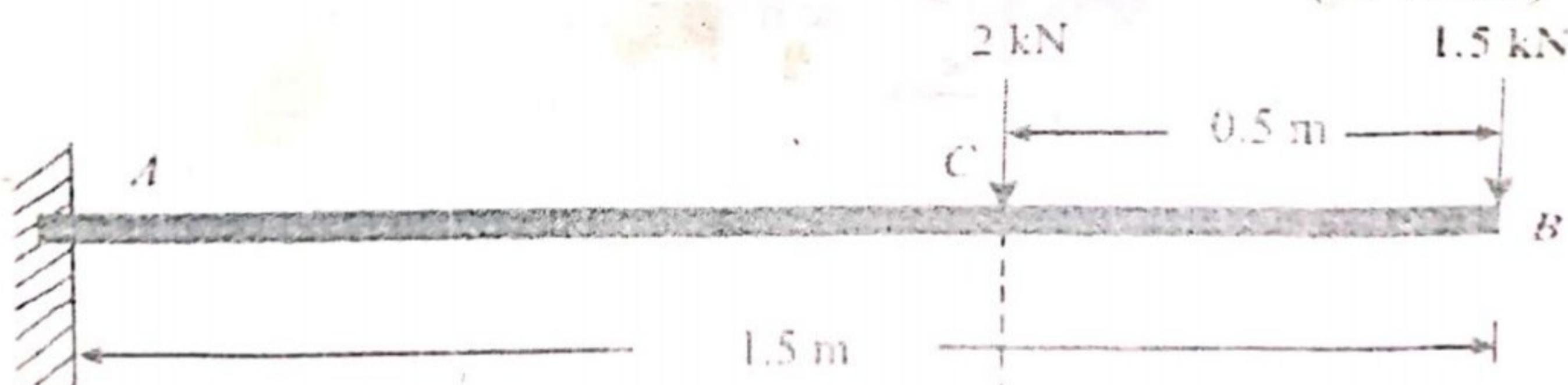
Question 4 (25 marks)

- A) Define the following terms: (i) Shear force, (ii) Shear force diagram, (iii) Bending moment, (iv) Bending moment diagrams, (v) Cantilever beam. (5 marks)
- B) Show that the maximum bending moment of a cantilever AB of length l and carrying a uniformly distributed load of w per unit length, over the entire length of the cantilever as shown below is given as $\frac{wl^2}{2}$ (20 marks)



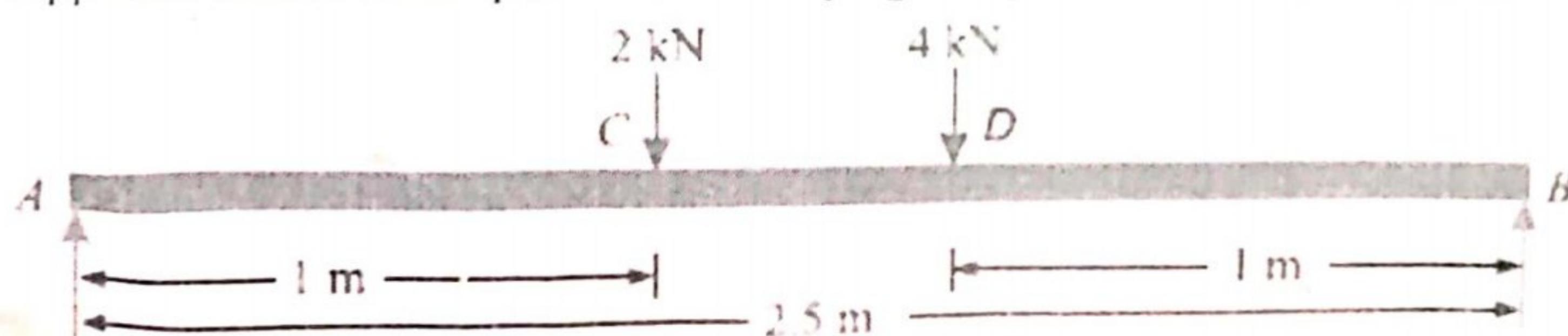
Question 5 (25 marks)

- A) What are the different types of loads acting on a beam? (5 marks)
- B) Draw shear force and bending moment diagrams for a cantilever beam of span 1.5 m carrying point loads as shown below. (20 marks)



Question 6 (25 marks)

- A) Diagrammatically, list the various types of support in Civil Engineering structures. (5 marks)
- B) A simply supported beam AB of span 2.5 m is carrying two-point loads as shown below (20 marks)





FEDERAL UNIVERSITY OYE-EKITI

FACULTY OF ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

2020/2021 SECOND SEMESTER EXAMINATION

COURSE TITLE: Fluid Mechanics I

CODE: MEE 206

TIME ALLOWED: 2 Hours

UNITS: 2.0

CLASS: All Level Two Engineering and WMA

INSTRUCTIONS: Attempt any four questions

QUESTION ONE

- a) By Definition, bulk modulus $K = -V\left(\frac{dP}{dV}\right)$, proof that $K = \rho\gamma$ 5 marks
- b) The density of oil at $20^\circ C$ is 850 kgm^{-3} . Find its relative density and kinematic viscosity if the dynamic viscosity is $0.005 \text{ kgm}^{-1}\text{s}^{-1}$. 5 marks
- c) A U-tube manometer is arranged as shown in Figure 1, to measure the pressure difference between two pipelines A and B, both carrying water of density 1000 kg/m^3 . The density of manometric fluid is $13,600 \text{ kgm}^{-3}$. Calculate the pressure difference if h_1 is 2.4 m , h_2 is 1.6 m and h is 1.4 m .

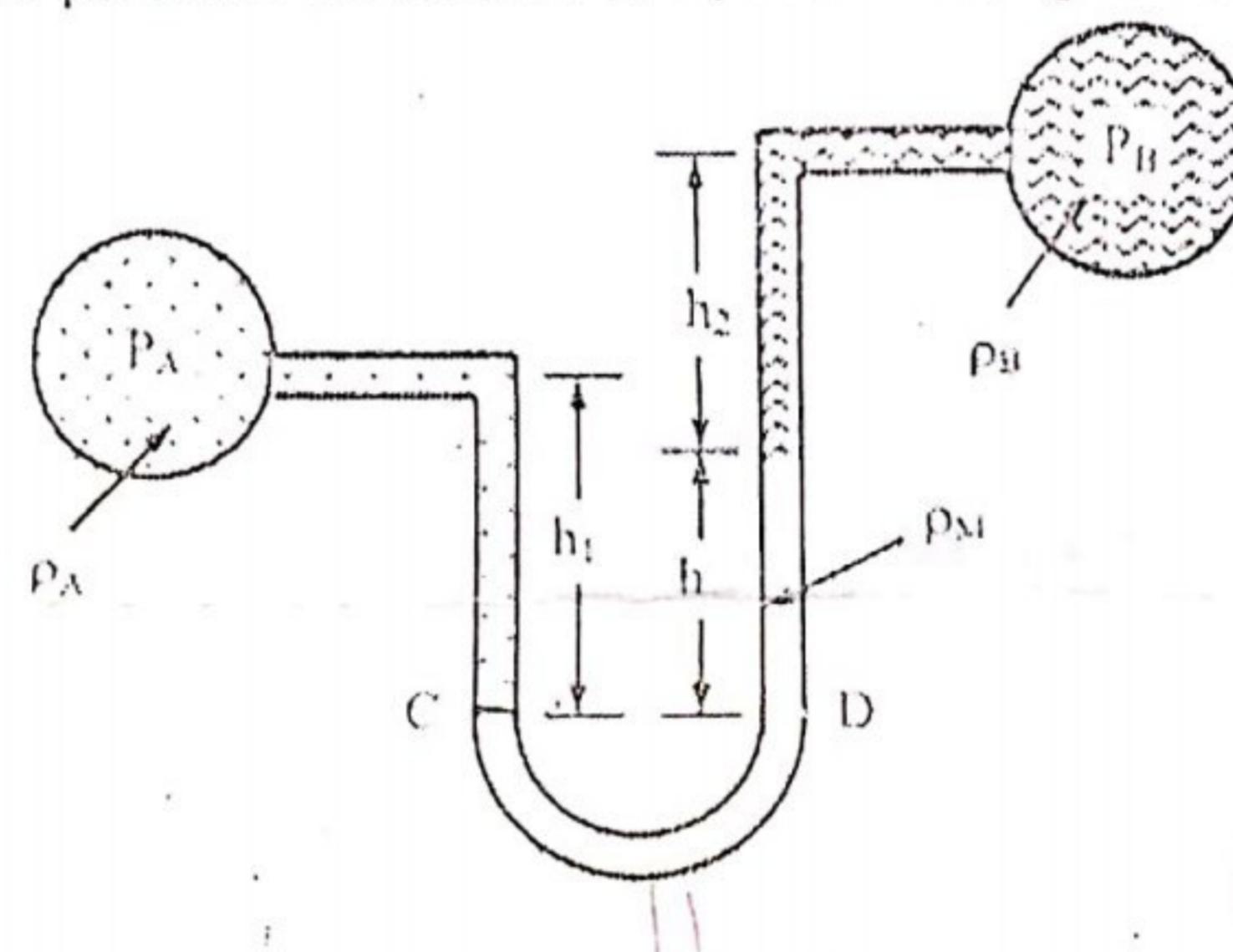


Figure 1

5 marks

QUESTION TWO

- a) Explain the following terms in relation to shear stress Dilatant substances, Viscoelastic materials and Thixotropic substances 6 marks
- b) Define the following terms
i. Fluid ii. Bulk Modulus of Elasticity iii) Isentropic process 6 marks
- c) State two Distinctions between a solid and a fluid in relation to elastic limit 4 marks
- d) With the aid of diagram explain the capillary phenomenon. Hence show that $h = \frac{4\sigma\cos\theta}{\omega d}$ 4 marks

QUESTION THREE

- a) The compression and expansion of gases takes place according to various laws of thermodynamics. Isothermal process: is a constant temperature process and is characterized by Boyle's law. Show that $K = \frac{P}{T}$ 7 marks
- b) A cylinder contains 0.35 m^3 of air at $50^\circ C$ and 2.76 bar . The air is compressed to 0.071 m^3 . Assuming isentropic condition, what is the final pressure and temperature, and what is the bulk modulus of elasticity ($\gamma = 1.4$)? 8 marks
- c) With the aid of a diagram explain the principle of Inverted U-Tube manometer 5 marks

F A A*

QUESTION FOUR

- a) For the hydraulic jack show in Fig 2 below. Find the load lifted by the large piston when a force of 400 N is applied on the small piston. Assume the specific weight of the liquid in the jack is 9.81 kNm^{-3} 5 marks

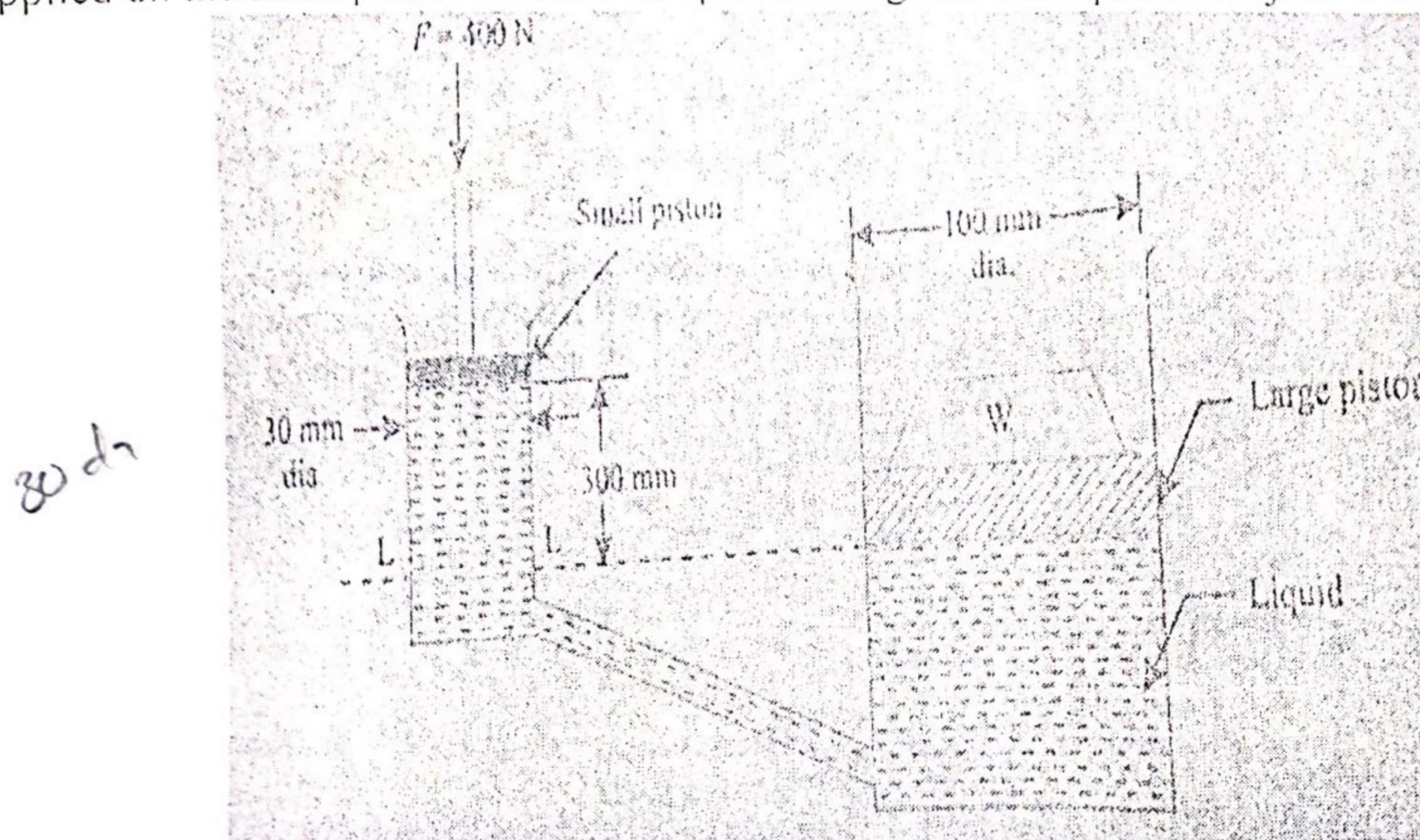


Figure 2

- b) Stratified fluids are two or more fluids of different densities, which float on the top of one another without mixing together. Proof mathematically that the total weight exerted by the fluids is equal to the product of the area and total pressure. 7 marks
- c) Derive the Continuity Equation as it relates to fluid. 6 marks

QUESTION FIVE

- a) With the aid of graph show the relationship of shearing stress versus shearing strain for various types of fluids. 6 marks
- b) Define the following terms i) Total pressure ii) stable and neutral equilibrium. 3 marks
- c) Air is compressed to 0.096 m^3 in a cylinder containing 0.48 m^3 of air at 50°C and 2.8 bar.
 (i) Assuming isothermal conditions, what is the pressure at the new volume and what is the bulk modulus of elasticity?
 (ii) Assuming isentropic conditions, what is the final pressure and temp, and what is the bulk modulus of elasticity? Given that $\gamma = 1.4$ 11 marks

QUESTION SIX

- a) Consider the motion of a high viscous fluid illustrated in Figure .2, the fluid is confined between two parallel plates by a small distance y . The lower plate is stationary while the upper plate is moving with velocity U . The upper plate is acted upon by a constant force F and thus moves at a constant velocity U . Because of adhesion, the fluid in contact with the upper plate moves with the same velocity as the plate, whereas the fluid in contact with the stationary plate has a velocity equal to zero. A velocity gradient is thus set up in the fluid. Experiments have shown that the force F varies with the area of the plate A , with velocity U and inversely with distance y .

Proof that the dynamic viscosity, $\mu = \frac{\text{Force} \times \text{Time}}{\text{Area}}$ 12 marks

- b) Find the change in volume of 2.00 m^3 of water at 26.7°C when subjected to a pressure of 1.0 bar and bulk modulus of elasticity is 2.24 GNm^{-3} 4 marks
- c) From the following test data, determine the bulk modulus of elasticity of water at 30 bar, the volume was 1.00 m^3 and at 180 bar, the volume was 0.99 m^3 4 marks



**FEDERAL UNIVERSITY OYE-EKITI, EKITI STATE,
NIGERIA DEPARTMENT OF
COMPUTERENGINEERING
B.ENG DEGREE EXAMINATION
SECOND SEMESTER 2020/2021 SESSION**

COURSE CODE: ENG202 (3 UNITS) [3-0-0]

COURSE TITLE: ENGINEERING MATHEMATICS II

Instruction: Attempt ANY Five (5) Questions Time Allowed: 3 Hours

QUESTION ONE

- a. Given that $Ax = \lambda x$, determine the Eigen values and Eigen vectors of the equation,

$$\text{where } A = \begin{bmatrix} 2 & 0 & 1 \\ -1 & 4 & -1 \\ -1 & 2 & 0 \end{bmatrix}$$

(4marks)

- b. Determine the inverse of $\begin{pmatrix} 3 & -1 \\ -4 & 7 \end{pmatrix}$

(2marks)

- c. In a star-connected circuit, currents i_1, i_2, i_3 flowing through impedances Z_1, Z_2, Z_3 are given by:

$$i_1 + i_2 + i_3 = 0$$

$$Z_1 i_1 - Z_2 i_2 = e_1 - e_2$$

$$Z_2 i_1 - Z_3 i_3 = e_2 - e_3$$

If $Z_1=10$; $Z_2=8$; $Z_3=3$; $e_1-e_2=65$; $e_2-e_3=160$; apply the determinant method (crammer's rule) to determine the values of i_1, i_2 and i_3 .

(4marks)

QUESTION TWO

- a. Find the value of k for which the following equations are consistent:

(3marks)

$$3x + y + 2 = 0$$

$$4x + 2y - k = 0$$

$$2x - y + 3k = 0$$

- b. Solve the set of equations below using the inverse matrix method.

(4marks)

$$x_1 + 2x_2 + x_3 = 4$$

$$3x_1 - 4x_2 - 2x_3 = 2$$

$$5x_1 + 3x_2 + 5x_3 = -1$$

- c. If $A = \begin{pmatrix} 3 & 4 & 5 \\ 1 & -2 & 3 \\ 4 & 5 & 6 \end{pmatrix}$, Determine whether A is singular or non-singular; what is the rank of A ?

(3marks)

QUESTION THREE

- a) Solve the following differential equation by power series method up to powers of 4:

(4marks)

- i) $2xy' + x^2y = 0$
 ii) $(1 - x^2)y' + (1 - x)xy = 0$
 b) Reduce the given differential equations to first order

(3marks)

- i) $2xy'' = 3y'$
 ii) $xy'' + 2y' = 0$
 c) Use the Leibnitz theorem to obtain the 5th derivation of the following functions

(3marks)

- i) $y = x^4 \cos 2x$
 ii) $y = x^3 e^{4x}$

QUESTION FOUR

- a. Using Operator D, find the solution of the system given by:

$$\frac{d^3y}{dx^3} - 2\frac{d^2y}{dx^2} + 4\frac{dy}{dx} - 8y = 0 \quad (4\text{marks})$$

- b. Given the ordinary differential equation: $\frac{dy}{dt} + 2y = 1 + 2t + e^{-t}$ with $y(0) = 0$. Find the complimentary y_c and Particular y_p (3marks)

- c. Given the linear homogenous differential equation: $x^3 \frac{d^3y}{dx^3} + 2x^2 \frac{d^2y}{dx^2} + 3x \frac{dy}{dx} - 3y = x^2$, use Operator D to obtain the solution (3marks)

QUESTION FIVE

- (a) Find $\frac{d^7y}{dx^7}$ in each of the following.

- i) $y = \sin x$
 ii) $y = \cos x$
 iii) $y = \sinh ax$

- (b) Differentiate $(1 + x^2)y'' + 2xy' - 5y = 0$ n times (2marks)

- (c) Solve the equation $\frac{d^3y}{dx^2} + \frac{dy}{dx} + 2xy = 0$ given that:

$$\text{at } x = 0, y = 0 \text{ and } \frac{dy}{dx} = 1$$

QUESTION SIX

- a) Solve the differential equation $y'' + 9y = 5\sin 3x$ (5marks)

- b) Use the method of undetermined coefficients to obtain the solution of differential equation

$$y'' + 4y' + 3y = e^{-3x}; y(0) = 1/2, \text{ and } y'(0) = -2$$

- c) Reduce equation $xy'' + 2y' = 0$ to first order. Hence, solve the equation (2marks)

QUESTION SEVEN

- a) Solve the equation $x^2y' = xy + y^3; y(1) = 2$ (3marks)

- b) Form the differential equation for $y = Ae^{2x} + Be^x + c$ (5marks)

- c) Solve the differential equation $y' - 4y = 2x - 4x^2$ (4marks)

**FEDERAL UNIVERSITY OYE-EKITI
FACULTY OF ENGINEERING
MECHANICAL ENGINEERING DEPARTMENT
SECOND SEMESTER EXAMINATION 2020/2021 ACADEMIC SESSION**

COURSE TITLE: Workshop Technology II

COURSE CODE: MEE 204

TIME ALLOWED: 1 $\frac{1}{2}$ hours

COURSE UNIT: 1

LEVEL: 200

INSTRUCTION: Attempt only three questions in all.



FEDERAL UNIVERSITY OYE-EKITI

DEPARTMENT OF MECHATRONICS ENGINEERING

B.Eng. Degree Examination
Second Semester 2020/2021 Session

COURSE CODE: MTE204

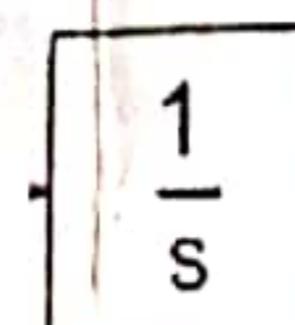
COURSE TITLE: COMPUTER AIDED ENGINEERING II UNITS: 2 Time: 2 hours: 30 minutes

Instructions: Answer all questions in Section 1 that contains 4 parts, then answer Two question each from section 2 and 3 respectively.

Section 1 (compulsory) answer all questions in the 3 parts:

Part 1. Introduction to SIMULINK

1. State ONE SIMULINK block library. [1 mark]
2. Write the name of the SIMULINK block shown below. [1 mark]



3. Signal output in SIMULINK sent to MATLAB can be viewed in which of the MATLAB windows. [1 mark]
4. Signal line branching is possible when creating SIMULINK model (True or False) [1 mark]
5. State ONE of the Time Domains a system can be modeled in SIMULINK [1 mark]
6. State the Effect of the Refine Factor on SIMULINK signal output. [1 mark]
7. Justify SIMULINK as interactive software [1 mark]
8. State the importance of the Scope Block to a developed model. [1 mark]
9. List ONE type of state that can occur in a Simulink model. [1 mark]
10. Simulink is applicable for the simulation of all system types (True or False). [1 mark]
11. Describe the importance of TIME in Simulink simulation. [1 mark]
12. In what window is Simulink model created. [1 mark]

Part 2. Introduction to Data Analysis in Python

13. How would you explain Data to a school-aged sibling? [1 mark]
14. Age and Weight are identifiers that store two different types of data. State these data types. [1 mark]
15. Identifiers are frequently used in Python, but there are some rules to follow. Mention One guidelines you would follow when creating an identifier in Python. [1 mark]
16. While writing a program you entered Names as a Tuple and Marks as a List. Why? [1 mark]
17. Explain the process of Data Analysis? [1 mark]
18. How important is the use of Control States and Loops in a program? [1 mark]
19. Distinguish between an If-Else Statement and an If-Elif-Else Statement. [1 mark]
20. Distinguish between the Break and Continue control statement. [1 mark]
21. Describe the importance of Creating Functions while writing a program. [1 mark]
22. In Python, describe the relationship between a Class and an Object. [1 mark]
23. Why would you use the __inti__ method when creating a Python class? [1 mark]
24. The term TensorFlow is made up of two terms – Tensor and Flow. Describe them. [1 mark]

Part 3. Introduction to ANSYS Workbench

25. State the attribute of ANSYS Workbench that qualify it as an indispensable tool in Project Management. [1 mark]
26. State ONE window in the main interface of the ANSYS Workbench software. [1 mark]
27. State the function of the Archive command in ANSYS Workbench. [1 mark]
28. State ONE system in the ANSYS Workbench Toolbox. [1 mark]
29. List ONE Top Menu Sub-Menus in ANSYS Workbench. [1 mark]
30. Interpret the Cell State in ANSYS Workbench depicted below. [1 mark]

Part 4. CAELinux and OpenFOAM

31. Which of this is a CAE solver? (a)Elmer (b)FreeCAD (c) Salome (d)Octave [1 mark].
32. One of this is not for visualization or post-processing in CAELinux (a) COMSOL Multiphysics (b) Salome (c) GMSH (d) Paraview [1 mark].
33. CAELinux is an open source software. True or False? [1 mark].
34. The usage of CAELinux includes for commercial applications. True or False? [1 mark].
35. Which of this is a CAE solver for Finite Element analysis? (a) Code-Aster (b)Gerris (c) OpenFOAM (d)Netgen [1 mark].
36. One of these units is not captured in the "dimensionSet" of OpenFOAM. (a) s (b) Å (c) kg (d) mol [1 mark].
37. OpenFOAM® contains a C++ class library named primitive? True/False [1 mark].
38. To output in OpenFOAM _____ function is used (a) cout (b) Info (c)I/O (c) printout [1 mark].
39. The OpenFOAM® syntax closely mimics the syntax used in written mathematics, using descriptive functions or symbolic operators? True/False [1 mark].
40. PDEs must be discretized in time and space before they can be solved in OpenFOAM? True/False [1 mark].

Section 2

Instruction: Answer Two questions from this section

Question One

- (a) Create the matrix $a = \begin{bmatrix} 4 & 7 & 8 \\ 6 & 3 & 5 \\ 9 & 8 & 12 \end{bmatrix}$ and matrix $t = \begin{bmatrix} 4 \\ 8 \\ 10 \end{bmatrix}$ in Python Using the matmul function multiply the two matrices and print the transpose. [4 marks]

- (b) Using the while loop with break statement, create a program that prints the output as shown below. [3 marks]

I love Nigeria 10
I love Nigeria 9
I love Nigeria 8
I love Nigeria 7
I love Nigeria 6

- (c) Sketch the SIMULINK model for the system given as $\dot{y} = t^2 + \frac{7}{t} y$ [4 marks]

- (d) Discuss the procedure for achieving external initial condition input with the Integrator Block. [2 marks]

- (e) Distinguish between Analysis system and Custom system in ANSYS Workbench. [2 marks]

Question Two

- (a) Sketch the SIMULINK model for the system given as $\ddot{x} - 6\dot{x} + 8x = e^{3t}$. [4 marks]
- (b) Enumerate TWO steps involved in system model creation in SIMULINK. [2 marks]
- (c) Create the dataset given below in Python. [3 marks]

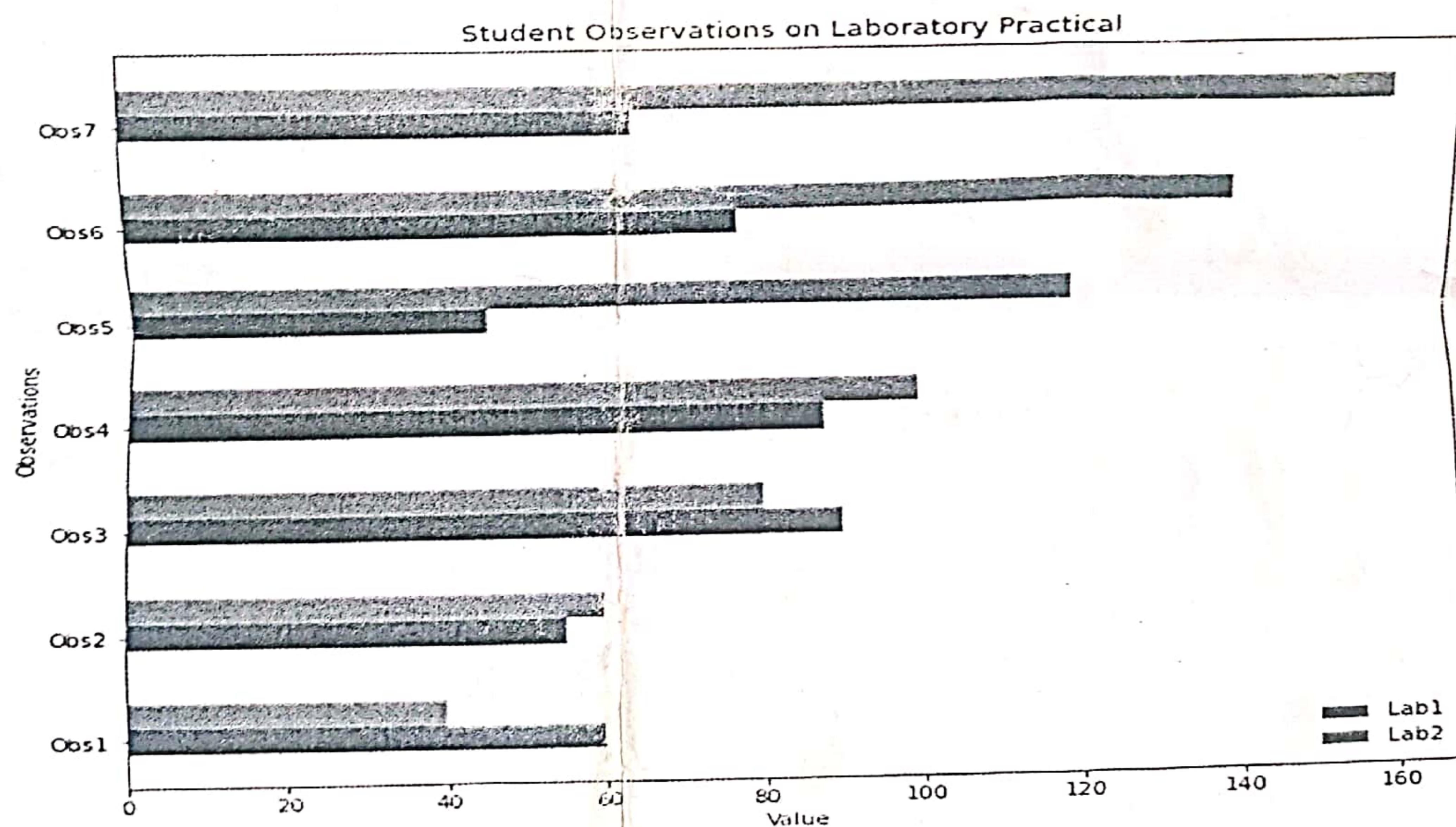
Course	Femi	John	Ifoma
Biology	60	68	80
Chemistry	50	70	70
Math	80	44	60
Physics	65	25	45
Computer	N/A	N/A	N/A

- (d) Write a python code that checks if the weight of a person entered by the user is within 70 kg – 120 kg. Where this is true the program prints "Valid weight", else "Add more weight" is printed. When a person's weight is equal to or greater than 90 Kg it prints "Congratulations!!!, You can contest". [4 marks]
- (e) Explain TWO methods for Workflow creation in ANSYS Workbench. [2 marks]

Question Three

- (a) Describe TWO type of connector applicable in ANSYS Workbench. [2 marks]
- (b) The table and figure below show the results of a laboratory practical conducted in two laboratories. Create a Python program that will replicate the figure as shown and save your figure in your working folder. [8 marks]

Observations		Ob1	Ob2	Ob3	Ob4	Ob5	Ob6	Ob7
Value	Lab1	40	60	80	100	120	140	160
	Lab2	60	55	90	88	45	77	64



- (c) Sketch the SIMULINK model for the system given $y = e^t + \frac{4}{3}(\sin \omega t - \sin \omega t)$ [4 marks]
 (d) State the peculiarity of a Dynamic System. [1 marks]

Section 3

Instruction: Answer Two question from this section

Question Four

- (a) List any five Computational Fluid Dynamics solvers for CAE analysis. [5 marks].
- (b) Mention any five pre-processing packages in CAELinux. [5 marks].
- (c) Tabulate any five algebraic tensor operations showing the corresponding Mathematical description and OpenFOAM description. [5 marks].

Question Five

(a) Declare the following units in OpenFOAM:

- (i) ms^{-2}
- (ii) K
- (iii) $\text{kgm}^{-1}\text{s}^{-2}$
- (iv) mol [5 marks].

(b) Write on the two versions of Code-Aster are available in CAELinux [4 marks].

(c) How are the following represented in OpenFOAM:

- i. Scalars
- ii. Vectors
- iii. Matrices [6 marks].

Question Six

- ✓(a) CAELinux covers all the phases of product development. Mention any four of these phases. [4 marks].
- (b) Explain the roles of python, Salome and Code-Aster on the CAELinux platform. [6 marks].
- ✓(c) Give a brief history of the development and use of CAELinux. [5 marks].



FEDERAL UNIVERSITY OYE -- EKITI
FACULTY OF ENGINEERING
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SECOND SEMESTER 2020/2021 SESSION B. ENG. DEGREE EXAMINATION

COURSE TITLE: INTRODUCTION TO ELECTRICAL ENGINEERING COURSE CODE: EEE 202

COURSE UNIT: 2

TIME ALLOWED: 2 HOURS

INSTRUCTION: ANSWER FOUR (4) QUESTIONS

Question One

- Define the following terms (i) Phase (ii) Phase Difference (iii) In Phase (iv) lagging (v) Leading [5marks]
- Given that $v(t) = 120 \cos(377t + 45)$ and $i(t) = 10 \cos(377t - 10)$. find the instantaneous power and the average power absorbed by the passive linear network [4marks]
- (i) Explain briefly how a P-type silicon is formed [3marks]
(ii) Given $i_1(t) = 4 \cos(wt + 30^\circ)$ A and the $i_2(t) = 5 \sin(wt - 20^\circ)$ A. Find the sum of the two currents. [3marks]

Question Two

- Draw a well labelled diagram of a balanced wye-delta three phase connection [4marks]
- List two reason for an unbalance three phase system? [2mark]
- In Figure 1, the resistor R_L is adjusted until it absorbs the maximum average power. Calculate R_L and the maximum average power absorbed by it. [10marks]

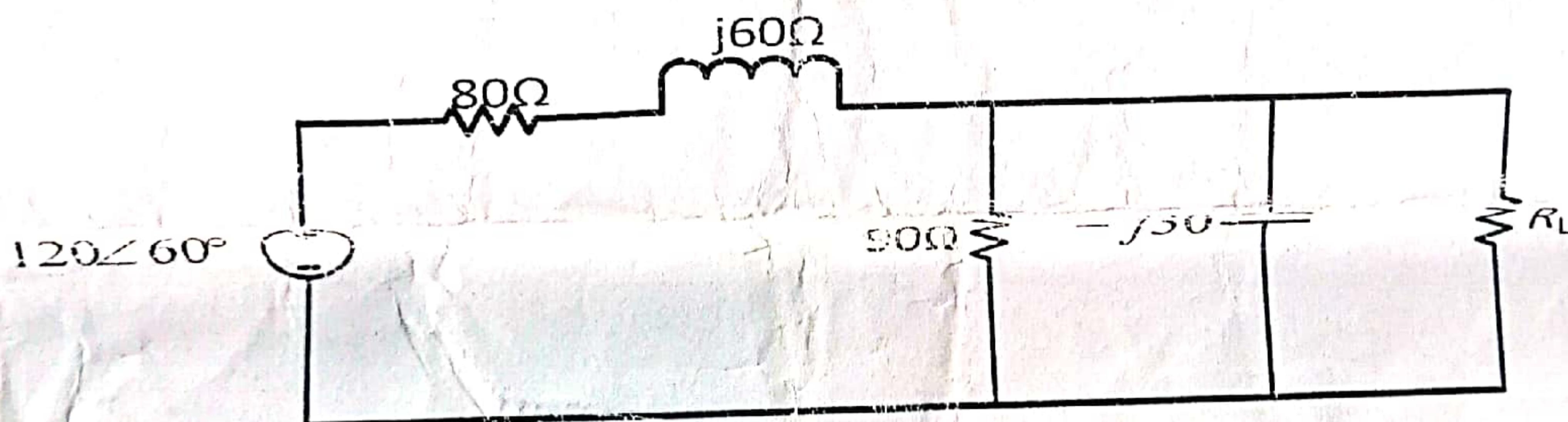


Figure 1

P.F.



Question Three

- Briefly explain the term Polyphase as used in three phase circuits? [1mark]
- Let $X = 8 < 40^\circ$ and $Y = 10 < -30^\circ$ Evaluate the following quantities and express your results in polar form (i) $(X + Y)X^*$ (ii) $(X - Y)^*$ (iii) $(X + Y)/X$ [6marks]
- A balanced abc-sequence Y-connected source with $V_{an} = 100 < 10^\circ$ is connected to a -delta-connected balanced load $8+j4\Omega$ per phase. Calculate the phase and line currents. [6marks]

Question Four

- What is power factor correction? how is Power corrected. [5marks]
- Explain briefly How a N-type silicon is formed [3marks]
- An unbalance Delta connected shown in Figure 4c is supplied by balance voltages of 200V in the positive sequence. Find the currents. Take V_{ab} as the reference [7marks]

$$I_A = \frac{Z}{V_{ab}}$$

P.A

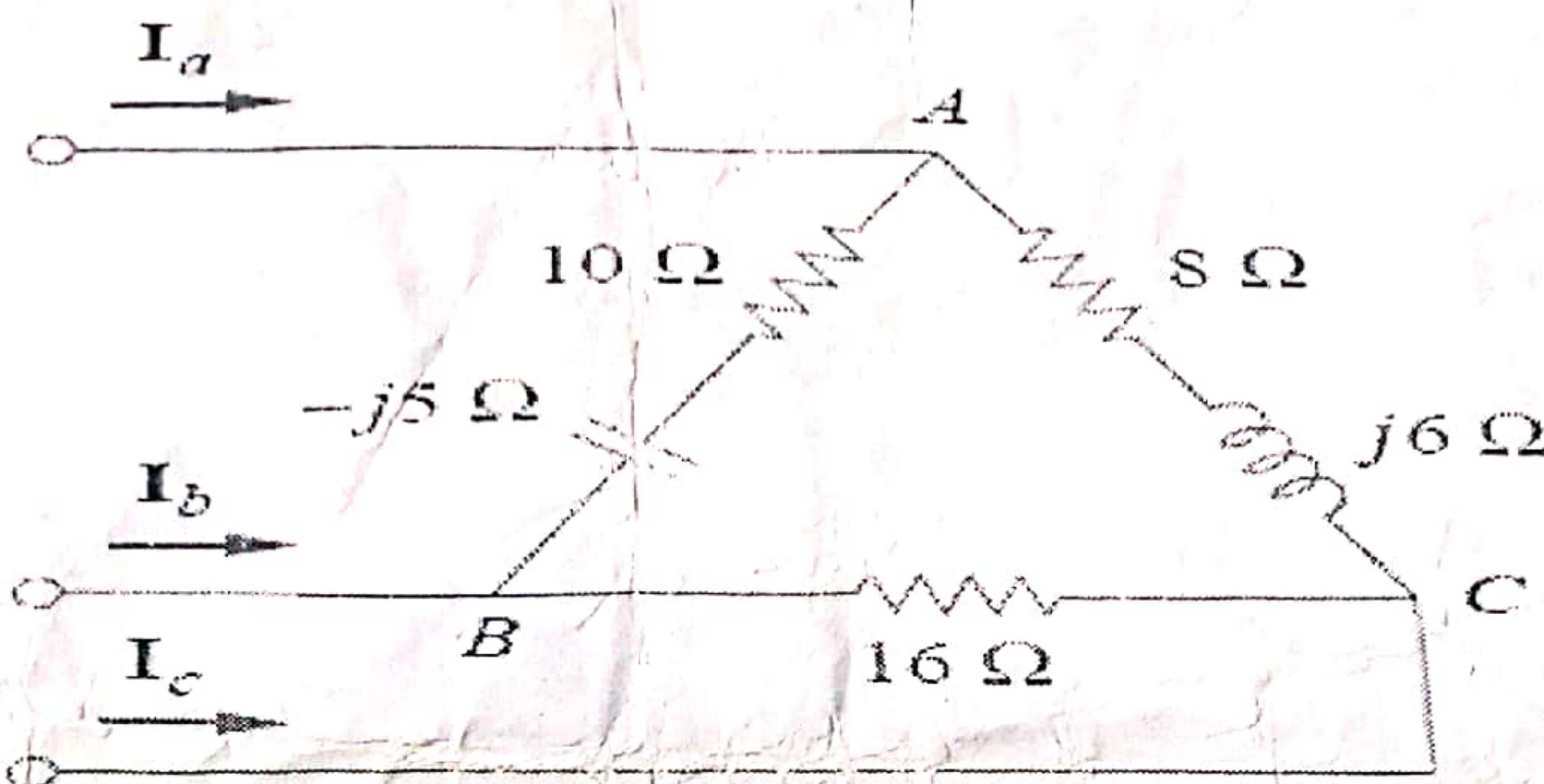


Figure 4c

Question Five

- Check whether the following signals are periodic or aperiodic
 (i) $\cos 2\pi t + \sin 2\pi t$ (ii) $x(t) = \cos 2\pi t + \sin 4\pi t$ (iii) $\cos 4\pi t + \sin \pi t$ [3marks]
- Evaluate the following complex number
 (i) $\frac{2+j3}{1-j6} + \frac{7-j8}{-5+j11}$ (ii) $\frac{(5<10^\circ)(10<-40^\circ)}{(4<-80^\circ)(-6<50^\circ)}$ (iii) $\begin{vmatrix} 2+j3 & -j2 \\ -j2 & 8-j5 \end{vmatrix}$ [6marks]
- Using wye-delta transformation, obtain the current flowing in the Figure 5Qc [6marks]

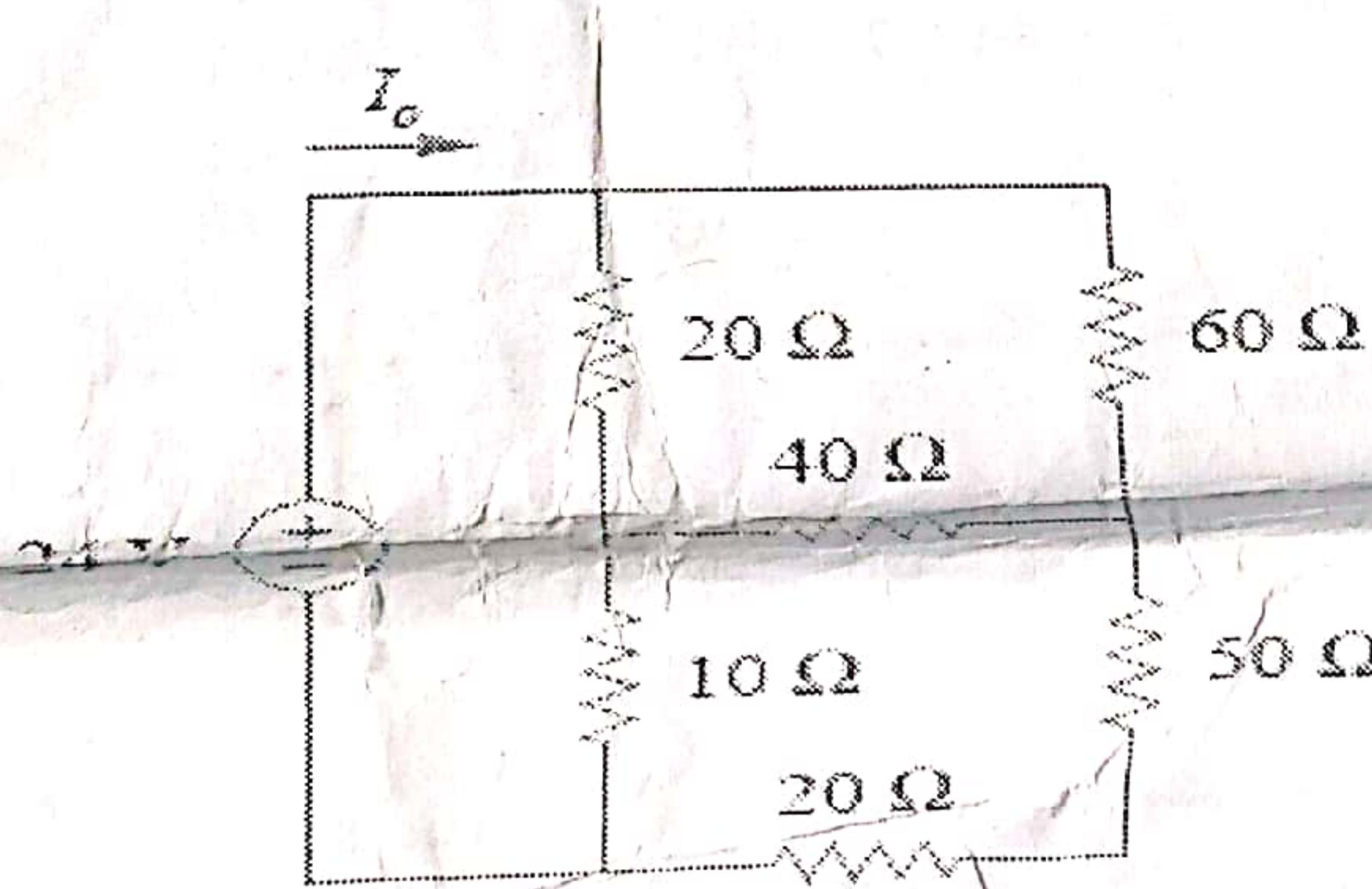


Figure 5Qc

Question Six

- List three importance of three phase systems [3marks]
- Sketch the graph of the current waveform below and determine its rms value. If the current is passed through a 4Ω resistor, find the average power absorbed by the resistor.

$$i(t) = \begin{cases} 5t & 0 < t < 2 \\ -10 & 2 < t < 4 \end{cases}$$
 [6marks]
- The voltage across a load is $v(t) = 180 \cos(\omega t - 20^\circ)$ v and the current through the element in the direction of the voltage drop is $i(t) = 3.5 \cos(\omega t + 60^\circ)$ A. Find (i) The complex and apparent power (ii) The real and reactive power (iii) The power factor and load impedance [6marks]