QUALIFICATION : **BACHELOR OF SCIENCE HONOURS**	
QUALIFICATION CODE: **08BOSH**	LEVEL: **8**
COURSE: **MATERIALS PHYSICS**	COURSE CODE: **MAP821S**
DATE: **NOVEMBER 2024**	SESSION: **1**
DURATION: **3 HOURS**	MARKS: **100**

FIRST OPPORTUNITY: QUESTION PAPER

EXAMINER:	Professor Dipti Ranjan Sahu
MODERATOR:	Dr Zivayi Chiguvare

INSTRUCTIONS :

1. Answer all questions on the separate answer sheet.
2. Please write neatly and legibly.
3. Do not use the left side margin of the exam paper. This must be allowed for the examiner.
4. No books, notes and other additional aids are allowed.
5. Mark all answers clearly with their respective question numbers.

PERMISSIBLE MATERIALS:

1. Non-Programmable Calculator

This paper consists of 3 pages including this front page

QUESTION 1:   **[20 MARKS]**

1.1   How materials are classified   (3)

1.2   What two main factors affect the packing of ions in ionic solids?   (2)

1.3   A piece of copper originally 305 mm long is pulled in tension with a stress of 276 MPa.   (5)
        If the deformation is entirely elastic, what will be the resultant elongation?
        The elastic constant of copper is 110 GPa.

1.4   Explain the tensile engineering stress–strain behavior for a typical metal alloy to the   (10)
        point of fracture and compare with compressive engineering stress-strain curve for
        the same alloy.

QUESTION 2:   **[20 MARKS]**

2.1   The angle of acceptance of an optical fiber is 300 when kept in air. Find the acceptance   (5)
        angle when the same fiber is immersed in water of refractive index 1.33

2.2   Which factors determine the characteristic colors of metals and transparent nonmetals.   (4)

2.3   Explain thermal expansion of solid materials   (5)

2.4   A brass rod is to be used in an application requiring its ends to be held rigid. If the rod (4)
        is stress free at room temperature what is the maximum temperature to which the rod
        may be heated without exceeding a compressive stress of 172 MPa? Assume a modulus
        of elasticity of 100 GPa for brass.

2.5   What is luminescence and how it is classified   (2)

QUESTION 3:   **[20 MARKS]**

3.1   What are the basic steps in the processing of ceramic products by the agglomeration   (3)
        of particles?

3.2   How is a glass distinguished from other ceramic materials   (2)

3.3   Name two glass-forming oxides. What are their fundamental subunits and their shape.   (4)

3.4   Why the numbers 6, 6 and 6 are put in the name of nylon-6, 6 and nylon-6   (3)

3.5   Differentiate Novolac and Bakelite polymers based on their structure property   (4)

3.6   How composites are classify based on matrices   *(4)*

QUESTION 4:   **[20 MARKS]**

4.1   What is magnetic dipoles and magnetic dipole moment   (4)

4.2   Explain para magnetic materials   (6)

4.3   The magnetic field of 1800Am^{-1} produces a magnetic field 3 x 10^{-5} Wb in an iron bar of
        cross-sectional area 0.2cm2, Calculate permeability.   (4)

4.4   Plot the hysteresis curve of soft magnetic materials and mention its properties   (6)

QUESTION 5:   **[20 MARKS]**

5.1   What is the dielectric loss angle and dielectric loss factor for a dielectric material?   (4)

5.2   Derive the relation between polarization and dielectric constant   (10)

5.3   Find the polarization produced in a dielectric medium of relative permittivity 15 in   (6)
        presence of an electric field of 500 V/m.

END of QUESTION PAPER