M.Sc. 2nd Semester Examination, 2023

PHYSICS

(*Inventions and Application*)

PAPER — PHS-204 (CBCS)

Full Marks : 40

Time : 2 hours

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

1. Answer any *four* of the following questions : 2×4

    (*a*) Write two important development of physical science before 20th century.

    (*b*) Explain why Archimedes' principle is valid in moon's (natural satellite) surface but not in artificial satellites ?

    (*c*) How was the concept of gravitation of Newton modified by Einstein ?

(d) Explain how a LDR can be used as a photo-detector ?

(e) What is Holography ?

(f) Explain what is meant by single crystal ?

2. Answer any *four* of the following questions : 4×4

(a) Write down the observations and conclusions of the Rutherford's alpha-particles scattering experiment. 4

(b) How is rainbow formed ? -explain. 4

(c) (i) The planet Mercury travels around the Sun with a mean orbital radius of $5.8 \times 10^{10} \, m$. The mass of the Sun is $1.99 \times 10^{30} \, kg$. Use Newton's version of Kepler's third law to determine how long it takes Mercury to orbit the Sun. Give your answer in Earth days.

(ii) What do you mean by photoelectric effect ? $3 + 1$

(d) Explain the working principle of Magneto Resonance Imaging (MRI). 4

(*Continued*)

(**3**)

(e) What do you mean by optical fibre and what is its advantage over normal copper wire communication ? 4

(f) Write down the working principle of Tube light. 4

3. Answer any *two* of the following questions : 8 × 2

(a) (i) Will the same ship float higher in salt water than in freshwater ? Explain your answer.

(ii) Write the laws of photoelectric effect.

(iii) For constructive interference to take place between two monoenergetic light waves of wave length λ, calculate the path-difference between these two waves.
2 + 3 + 3

(b) (i) A huge helium filled spherical balloon is prevented from floating upward by a rope tying it to the ground. The balloon plastic structure plus all the helium gas inside of the balloon has a total mass of 9.2kg.

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The diameter of the balloon is $3.5m$. The density of air is 1.293kg. m^{-3}. What is the tension in the rope ?

(ii) Establish a relation between half and mean lives of the radioactive elements.

(iii) Write the applications of Ultrasonography (USG).   3 + 3 + 2

(c) (i) What do you mean by modulation ?

(ii) Why modulation is necessary for wireless communication ?

(iii) Write difference between AM and FM radio.   1 + 3 + 4

(d) (i) Why it is essential to fabricate a solar cell with single crystal ?

(ii) Describe in details Czochralski method to grow single crystal of silicon.

(iii) What is meant by amorphous material ?   2 + 5 + 1