2023/TDC(CBCS)/EVEN/SEM/
PHSHCC-601T/009

TDC (CBCS) Even Semester Exam., 2023

PHYSICS

(Honours)

(6th Semester)

Course No. : PHSHCC-601T

(Electromagnetic Theory)

Full Marks : 50
Pass Marks : 20

Time : 3 hours

The figures in the margin indicate full marks for the questions

SECTION—A

Answer any *ten* questions from the following : 2×10=20

1. What is meant by Lorentz gauge?

2. What do you understand by scalar and vector potentials?

3. Which of the Maxwell's equations represents the modified differential form of Ampere's circuital law?

4. What is dielectric constant? How is it related to the refractive index in case of dielectrics?

5. Write two characteristics of plasma.

6. What is wave impedance? Give the necessary formula.

7. Write down the electromagnetic boundary conditions.

8. Explain Brewster's law of polarization.

9. What do you mean by parallel and perpendicular polarizations?

10. What do you understand by linear polarization?

11. What is quarter-wave plate? Mention one use of it.

12. Explain uniaxial and biaxial crystals.

13. Explain briefly what you mean by waveguide.

14. What do you understand by phase change on reflection?

15. What is optical fibre? Mention two of its uses.

SECTION—B

Answer any *five* questions from the following : 6×5=30

16. *(a)* Write down Maxwell's four fundamental equations of electromagnetism. 4

(b) Explain Coulomb gauge in brief. 2

17. *(a)* Define Poynting vector for EM waves. What does it represent? 3

(b) Give the physical concept of electromagnetic field energy density. Define momentum density. 2+1=3

18. *(a)* What is plasma? Discuss its composition. 2

(b) Give macroscopic and microscopic descriptions of plasma. 4

19. *(a)* Explain solar corona and solar wind. 3

(b) Write a note on Van Allen radiation belt. 3

20. *(a)* Mention the relation between Brewster's angle and critical angle. 2

(b) What are reflection and transmission coefficients? 2

(c) How are evanescent waves formed? 2

21. (a) What are the boundary conditions at a plane interface between two media? Mention the significance of the boundary conditions. 4

(b) What are perpendicular and parallel polarizations? 2

22. (a) What are plane, elliptical and circularly polarized light? 3

(b) Explain how plane, elliptical and circularly polarized light are produced. 3

23. (a) What are phase retardation plates? 2

(b) Describe Babinet's compensator and explain its uses. 4

24. What are the types of dielectric waveguide? State about planar waveguide materials. Give an example of dielectric waveguide.

2+3+1=6

25. (a) What is step-index planar waveguide? 2

(b) Explain single-mode and multiple-mode fibres. 4

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