Reg. No ....   Name **25U462**

B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2025
SEMESTER 4 : PHYSICS (COMPLEMENTARY FOR MATHEMATICS)
COURSE : **19U4CPPHY07 : OPTICS AND ELECTRICITY**
(For Regular 2023 Admission and Improvement/Supplementary 2022/2021/2020/2019 Admissions)

Time : Three Hours   Max. Marks: 60

PART A
Answer any 8 (2 marks each)

1. Intensities of spectral lines with a grating are much less than those with a prism. Why?
2. Define electric displacement vector?
3. Describe briefly two methods to increase the fringe width in Young's interference fringes?
4. What is meant by dispersive power of a grating?
5. What are non polar dielectrics?
6. Plot the instantaneous current and voltage when an alternating voltage is applied across a capacitor.
7. What is half period zone? Why is it so called?
8. State Einstein's predictions on stimulated emission.
9. What are the functions of optical resonator?
10. Differentiate between inductive reactance and capacitance reactance.

(2 x 8 = 16)

PART B
Answer any 6 (4 marks each)

11. If refractive index of the core and cladding material on an optical fibre are 1.55 and 1.50 respectively, compute the NA and acceptance angle of the fibre.
12. A 4 micro farad condenser is connected to 240 volt DC source through a resistor of 0.25 mega ohms. Calculate the charge on the condenser at 1 sec after the application of the voltage. Also evaluate the potential difference across the condenser and value of current in the circuit at 1 sec.
13. A 20 volt 5 watt lamp is to be used on ac mains of 200 volts with 50 cycles per sec. Calculate the capacitor that need to be put in series to run the lamp?
14. A plano convex lens of radius of curvature 0.7 m is place on a plane glass plate and Newton's rings are formed using monochromatic light. The radius of the 10th dark ring is 2.03 mm. Find the wavelength of light.
15. Calculate the NA of an step index fibre having the core and cladding refractive indices as 1.48 and 1.46 respectively. What is the maximum entrance angle for this fibre if the outer layer is air with refractive index as 1.
16. The dielectric constant of a polymer is 10. The electric field in the dielectric is 10^4 V/m. Calculate the electric displacement vector and polarisation.
17. A plano-convex lens is placed on a plane glass plate and illuminated normally with monochromatic light of wavelength 5893 Å. The diameter of the 15th dark ring is 5.9 mm. Calculate the radius of curvature of the surface.
18. In a Young's double slit experiment with monochromatic light, fringes of width 0.3 mm are formed on a screen. When the screen is moved by 25 cm, fringes of width (1/3) mm are obtained. What is the wavelength of light used if the width of the slit is 5 mm?

(4 x 6 = 24)

PART C
Answer any 2 (10 marks each)

19. What are non-polar and polar dielectrics? Define polarization vector. Obtain the relation connecting electric field intensity E, polarization vector P and dielectric displacement vector D.

20. Discuss the formation of interference fringes on a screen due to the monochromatic light passing through two parallel slits on an opaque screen. Also arrive at the expression for fringe width.

21. Discuss the LR series circuit in detail when an alternating voltage is applied across it.

22. Discuss the different pumping schemes adopted for producing laser action.

(10 x 2 = 20)