

Bachelor of Computer Application (BCA) Examination  
II Semester

**Physics-II**

Time : 3 Hours ]

[ Max. Marks : 40

**Note :** Attempt all five questions. Solve any two parts from each question.  
All questions carry equal marks.

1. (a) A plane wave exists in a lossless medium. The electric field is of the form  $\vec{E} = E_0 e^{i(\omega t - kz)} \hat{i}$  Define Phase Velocity and find its expression.
- (b) A transmission line with a characteristic resistance of  $50 \Omega$  is connected to a  $100 \Omega$  resistive load. Find the voltage reflection coefficient.
- (c) Write down the Maxwell's equations for free space.
2. (a) Three light waves combine at a certain point where their field components are :
 
$$E_1 = E_0 \sin \omega t,$$

$$E_2 = E_0 \sin (\omega t + 60^\circ)$$

$$E_3 = E_0 \sin (\omega t - 30^\circ).$$
 Find the resultant component  $E_r(t)$  at that point.
- (b) In a Newton's ring experiment, the radius of curvature 'R' of the lens is 5.0 m and the lens diameter is 20 mm. How many bright rings are produced ? Assume that  $\lambda = 589 \text{ nm}$ .
- (c) Explain the working of Michelson's interferometer.
3. (a) What is the resolving power of a grating ?
- (b) A slit 1.00 mm wide is illuminated by light of wavelength 589 nm. The diffraction pattern is observed on a screen 3.00 m away. What is the distance between the first two diffraction minima on the same side of the central diffraction maximum ?
- (c) What is a zone plate ? Explain.
4. (a) What is circular polarization ?
- (b) How can a plane polarized light be converted into circularly polarized light ?
- (c) What is a quarter wave plate ? Can a single quarter wave plate be used for two different wavelengths ?
5. (a) What is the frequency measured by a detector if a source emitting light of frequency  $f_0$  moves directly away from the detector with relative speed  $v$  ? What is this effect ?
- (b) Explain Coherence.
- (c) What is Stimulated Emission ?

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