

10

S. P. Sood

66310

Answer Key

SEI - I

Time: 3Hrs

Marks:-100

Q1. A) Select correct answer

(12)

- 1 a) $\pi b\lambda$
- 2 a) $\frac{2f\lambda}{a}$
- 3 a) 90°
- 4 b) Secondary wavelets
- 5 d) 226
- 6 b) $J = 1, K = 1$

B) Answer in one sentence

(3)

- 1 By using a convex lens
- 2 $I \propto \cos^2\theta$ or $I = I_1 \cos^2\theta$
- 3 Latch is an electronic sequential logic circuit used to store information in an asynchronous arrangement.

C) Fill in the Blanks

(5)

- 1 Thickness
- 2 Four
- 3 Circularly polarized light
- 4 Parallel
- 5 SIPO

Q2. A) Attempt any one

(8)

- 1 Diagram 2
- Explanation 6
- 2 Diagram 2
- Explanation 6

B) Attempt any one

(8)

- 1 Diagram 2
- Explanation 6
- 2 Diagram 2
- Explanation 6

C) Attempt any one

(4)

1 $x_n = \sqrt{\frac{(2n+1)(a+b)b\lambda}{a}}$ 1

Finding x_2 & x_3 2

Calculating $x_3 - x_2$ 1

2 Here $a = 0.16 \text{ mm} = 0.016 \text{ cm}$ and $b = 0.8 \text{ mm} = 0.08 \text{ cm}$

Equation for interference maxima is, $(a + b) \sin \theta = n\lambda$ 2

Equation for diffraction minima is,

$$\therefore \frac{(a+b)}{a} = \frac{n}{p}$$

2

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$$\therefore \frac{n}{p} = \frac{(0.016+0.080)}{0.016} =$$

1

$$\therefore n = 6 p$$

For the values of $p = 1, 2, 3$ etc.

$$n = 6, 12, 18 \text{ etc.}$$

1

Thus, the orders 6, 12, 18 etc. of the interference maxima will be missing from the diffraction pattern.

Q3. A) Attempt any one (8)

1 The process of transforming unpolarized light into polarized light is known as polarization. 2

Production diagram linear polarized light 2

Explanation 4

2 A quarter wave plates introduce a phase change between E-ray and O-ray gives $\pi / 2$ and Phase difference of $\lambda / 4$ between the E-ray and O-ray 2

propagating through it

Diagram

Explanation shows thickness of QWP 4

$$d = \frac{\lambda}{4(\mu_o - \mu_e)} \text{ for negative crystal}$$

$$d = \frac{\lambda}{4(\mu_e - \mu_o)} \text{ for positive crystal}$$

A quarter wave plates are used for producing elliptically or circularly polarized light 2

B) Attempt any one (8)

1 Scattering and absorption ray Diagram 4

Explanation about scattering of light 2

Explanation of selective absorption of light 2

2 Diagram 2

Process of reflection 2

Equation for Brewster law $\tan \theta_p$ 4

C) Attempt any one (4)

1 $\lambda = 5 \times 10^{-5} \text{ cm}$, $\mu_E = 1.55$ and $\mu_O = 1.54$. 2

When the phase difference between two emergent beams is π the resultant 2

of two beams is plane polarized, so $\lambda / 2$ is the path difference.

$$t = \frac{\lambda}{2(\mu_E - \mu_O)} = \frac{5 \times 10^{-5}}{2(1.55 - 1.54)} = 2 \times 10^{-3} \text{ cm}$$

2 Using $\mu_o - \mu_e = \frac{\lambda}{4d} = \frac{6000 \times 10^{-8}}{4 \times 1.47 \times 10^{-2}}$ 2

$$= \frac{6000 \times 10^{-6}}{5.88} = 1.02 \times 10^{-3} \text{ cm}$$

Q4. A) Attempt any one (8)

1 Block Diagram 2

Working 4

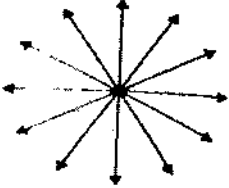
State transition table 2

2 Block Diagram 2

3

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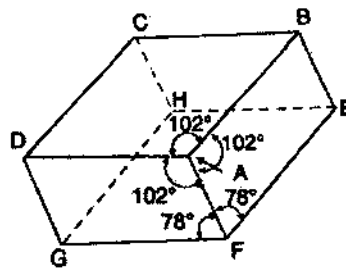
| | | |
|-----|---|--------|
| | Working Truth table | 4 2 |
| B) | Attempt any one | (8) |
| 1 | Block Diagram | 2 |
| | Working Truth table | 4 2 |
| 2 | Block Diagram | 2 |
| | Working Truth table | 4 2 |
| C) | Attempt any one | (4) |
| 1 | i. 43 | 1 |
| | ii. 45.640625 | 1 |
| | iii. 150.C | 1 |
| | iv. 0.110100 | 1 |
| 2 | i. 010011 | 1 |
| | ii. 111010011 | 1 |
| | iii. 00100010 | 1 |
| | iv. 01010101 | 1 |
| Q5. | Attempt any Four | (20) |
| 1 | First assumption | 1 |
| | Second assumption | 2 |
| | Third assumption | 1 |
| 2 | Explanation | 1 |
| | Equations | 2 |
| | Examples | 1 |
| 3 | Light is neither totally polarized nor unpolarized but it is a mixture of plane polarized light and unpolarized light. Partially polarized light is like a natural light and it can be represented in the form of superposition of two incoherent plane polarized wave with mutually perpendicular planes of oscillations. In case of natural light the amplitude of these waves is the same and for partially polarized light it is different. | 3 |
| |  | 2 |
| | partially polarized light | |
| 4 | The Calcite crystal is a common naturally occurring substance. Both marble and lime stone are made up of many small calcite crystals bonded | 3 |

4

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together. A large crystal of calcite is colourless and transparent. It was at one found in great quantities in Iceland and hence it is also known as Iceland spar. Naturally occurring calcite crystals has Rhombohedral shape which means it breaks into blocks with parallelogram shaped faces. It is bounded by six faces each of which is a parallelogram with angles equal to $101^{\circ} 55'$ and $78^{\circ} 5'$. The rhombohedron has only two corners A and H where all the face angles are obtuse ($101^{\circ} 55'$). These two corners appear as the blunt corners of the crystal. At the rest of six corners there is one obtuse angle and two acute angles.



Calcite crystal

2

- 5 Block Diagram
- Working
- Truth table
- 6 Disadvantages
- Synchronous counter

2
2
1
2
3
