2303N280

M.Sc. Sem.-1 Examination

403

Physics

March 2022

Candidate's Seat No : _____

Time : 2-00 Hours] **[Max. Marks : 50**

Instructions:

1. Attempt any THREE questions from Section I
2. Section II is compulsory.
3. All symbols carry their usual meanings

Section I

Q-1 (A) Write boundary conditions at oblique incidence and use it to obtain the *Fresnel's* equation and *Brewster's* angle equation. [7]

(B) Silver is an excellent conductor, but it's very expensive. Suppose you are designing a microwave experiment to operate at a frequency of 10^{10} Hz. How thick would you make the silver coating? [Take : $\rho_{silver} = 1.59 \times 10^{-8}$ Ωm, $\varepsilon = 8.85 \times 10^{-12}$ Fared/m, $f = 10^{10}$ s^{-1} and $\mu = 4\pi \times 10^{-7}$ Henry/m]. [7]

Q-2 (A) Explain the reflection from a *metal surface* and obtain the equation $R = 1 - 2\sqrt{\frac{2\omega\epsilon_1}{\sigma}}$. Use propagation vector K_T for conducting medium as [7]

$$K_T^2 = \epsilon_2 \mu_2 \omega^2 \left[1 + \frac{i\sigma}{\omega\epsilon_2}\right] = (\alpha + i\beta)^2.$$

(B) Explain in brief the total internal reflection. [7]

Q-3 (A) Discuss the Resonant cavities when a perfect conductor placed at half infinite space in the direction of propagating wave. Explain Q-factor and write some applications of cavities in waveguide. [7]

(B) Find the modes of 3cm wavelength radar waves that would be propagated in a waveguide of rectangular cross section with a = 1cm, b = 2cm. Find also the group velocity of the waves. [7]

Q-4 (A) Explain the propagation of waves between two conducting parallel planes and obtain the equation of guide wavelength. [7]

(B) Explain in brief the dielectric waveguides. [7]

Q-5 (A) With help of examples describe various data types used in C language. What are qualifiers (modifiers) in C language? Write different qualifiers available in C language and mention their advantages. [7]

PTO

(B) Write a program to read a decimal number and obtain binary number corresponding to it. Print both decimal number and binary number. [7]

Q-6 (A) With help of a bock diagram describe *nested if* construction. Write a program to read three numbers and find out highest number among them. [7]

(B) What is the difference between *while* loop and *do while* loop? Write a program to read a positive number, generate another number by reversing it. Print both original number and the reversed number. [7]

Q-7 (A) What is an array? give examples for initializing arrays by two methods. Write a program to read 50 values, find out average of lowest and highest. Program should print lowest and height values and mean of lowest and highest. [7]

(B) Write a program to read two strings, append (attach) the second string on the first string without using string handling functions. Print both strings. [7]

Q-8 (A) Write a program to read a square matrix, and check whether is it a symmetric matrix or not. A matrix is said to be symmetric if the transpose of the matrix is same as the original matrix. Print a proper message. [7]

(B) Write a program to read a line of text, generate a new string by removing all vowels from the string. Print both strings. [7]

Section II

Q-9 Attempt all Questions. Each question carries ONE mark.

i). An EM wave is propagating from lower refractive index n1=1 to higher refractive index n2 = 1.5, field remains constant E_0 = 2 N/C, What will be average power per unit area? [1]

(a) 35.4×10^{-12} W/m^2
(b) 8.854×10^{-12} W/m^2
(c) 13.281×10^{-12} W/m^2
(d) 17.708×10^{-12} W/m^2

ii). What is represented by β in the equation of electric field in case of propagation of wave as given below? [1]

$\tilde{E}_{0I} - \tilde{E}_{0R} = \beta \tilde{E}_{0T}$

(a) Brewster's angle
(b) Amplitude of outgoing waves
(c) Phase difference between reflected and transmitted waves
(d) Ratio of the product of permeability and speed of EM wave corresponding to medium-1 and medium-2.

iii). The waves in cavity are standing waves and not progressive. This cavity resonator will resonate at a frequency at which the length of the cavity is an integral multiple of _____, which measured in the waveguide? [1]

(a) half wavelength
(b) half amplitude
(c) half dimension
(d) half frequency

iv). Propagation constant does not depend on dimensions of the waveguide, which means that the guide wavelength is equal the free space wavelength. This indicates that there is a cut-off wavelength in a coaxial waveguide. This statement is _____ [1]

(a) absolutely false
(b) absolutely true
(c) partially true
(d) partially false

v). Which of the following should not be used as a variable name? [1]

(a) long
(b) big
(c) tall
(d) small

vi). What is the result of evaluation of the following C statements? [1]

```
int x, y;
x = 1+2/3-4*5;
y = 1/2+3*4-5;
```

(a) -19 8
(b) -18 7
(c) -18 8
(d) -19 7

vii). Output of the following C code segment? [1]

```
int i = 0;
while (++i)
    printf("*");
```

(a) *
(b) 0
(c) Compile time error
(d) * will be printed infinite times

PTO

viii). What would be output of the following C program segment? [1]

```
int a[5] = {1, 1, 2, 3, 5}, sum=0;
for(i=0; i<5; i++)
{
 if ((a[i]%2) != 0)
       continue;
sum += a[i];
}
printf("%d", sum);
```

(a) 2
(b) 3
(c) 4
(d) 10

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