

[32]

SEAT No. \_\_\_\_\_

SARDAR PATEL UNIVERSITY

No. of Printed Pages : 02

Sc

M.Sc.(ELECTRONICS) – II<sup>nd</sup> Semester Examination

Monday, DATE: 18-3-2019

TIME : 10 A.M. to 1 P.M.

PS02CELE 21 : ELECTROMAGNETISM AND ANTENNA THEORY

NOTE : Figures to the right indicate the maximum marks for the question.

TOTAL MARKS: 70

Q-1 Give the correct answer for the following Multiple Choice Questions. 8X1= [8]

1. For a plane electromagnetic wave in free space, the ratio of electric and magnetic field vector i.e. E and B is given by \_\_\_\_\_  
(i)  $E/B = 1/C$  (ii)  $E/B = C$  (iii)  $E/B = \mu_0 \epsilon_0$  (iv)  $E/B = \mu_0 / \epsilon_0$
2. The Ampere's law given by the equation  $\Delta \times B = \mu_0 \cdot J$  holds good for \_\_\_\_\_  
(i) Time-varying field (ii) Time independent field (iii) Both (i) and (ii) (iv) None of these
3. A \_\_\_\_\_ is a type of electrical transformer that can convert electrical signals that are balanced about ground to signals that are unbalanced and vice-versa.  
(i) Balun (ii) Stub (iii) Coupler (iv) Step-down transformer
4. For a constant reactance circle if  $X = 2$ , its radius is \_\_\_\_\_ and center is \_\_\_\_\_.  
(i) 1/2 (ii) 1/5 (iii) (1, 1/5) (iv) (1, 1/2)
5. For a rectangular waveguide if  $m = 1$ ,  $n = 2$  and if magnetic component is along the direction of wave propagation, it indicates \_\_\_\_\_  
(i)  $TE_{1,2}$  Mode (ii)  $TM_{1,2}$  Mode (iii)  $TE_{2,1}$  Mode (iv)  $TM_{2,1}$  Mode
6. The Non Resonant Antenna is \_\_\_\_\_  
(i) Unidirectional (ii) Bidirectional (iii) Both (i) and (ii) (iv) None of these
7. During the operation of \_\_\_\_\_ diode Negative Resistance Characteristics is exhibited.  
(i) PN Junction diode (ii) Schottky diode (iii) Gunn diode (iv) All of these
8. The frequency range of microwave region is  
(i) 0.3 to 3 GHz (ii) 1-100 GHz (iii) 30-300 MHz (iv) 3-30 MHz

Q-2 Give short answers to the following. (Any Seven) 7X2 = [14]

1. Explain the coulomb's law of electrostatics.
2. Write Maxwell's equations in Tabular form.
3. Enlist different types of Transmission Line. Draw figure of UTP and STP type of transmission line.
4. Define standing wave. Draw the standing wave patterns for multiple harmonics.
5. Discuss about half wavelength transmission Line.
6. Draw schematics of Isolator.
7. Explain various waveguide coupling methods.

(1)

(P.T.O)

(1)

8. Draw the structure of Travelling Wave Tube (TWT). List its parts name.

9. Draw schematics of cavity Magnetron. Write its applications.

Q-3 (a) With proper schematics derive an equation for the energy density of system of four charges in electric field. Also, write equations of energy density in magnetic field. [6]

(b) Distinguish between electrostatics and magnetostatics. State and Explain pointing theorem. Write corresponding equations. [6]

OR

(b) Explain concept of displacement current. Write a statement and deduce an equation for any one form of Gauss Law. [6]

Q-4 (a) Derive an equations for the field vectors of an electromagnetic wave propagation in dielectric medium. What do you mean by phase velocity? [6]

(b) Draw equivalent circuit of transmission line. Hence, deduce transmission line equations. From this Write equations for Loss less line. [6]

OR

(b) Briefly explain. (i) Constant resistance circle and (ii) constant reactance circle in context with the smith chart. Summarize the characteristics of smith chart. [6]

Q-5 (a) Discuss in detail different types of modes with its field pattern in context with any one type of waveguide. Enlist different types of waveguide structures. [6]

(b) Describe with proper schematics the working of circulators. Write its applications. [6]

OR

(b) Discuss about commonly used waveguide junctions. A waveguide has an internal breadth of 3 cm and carries the dominant mode of a signal of unknown frequency. If the characteristic wave impedance is  $500\Omega$  what is this frequency? [6]

Q-6 (a) Discuss the working principle of Reflex Klystron with proper schematics. Write its applications. [6]

(b) What is Gunn diode? Draw its construction and explain its working. Write its applications. [6]

OR

(b) Explain Antenna Radiation mechanism. Enlist different types of Antenna. Describe in detail any one type of Antenna with its radiation pattern. [6]

