Q1) Choose the correct option from the following questions. Each question carries equal marks.
(20 marks)

1) The ratio of maximum power density in the desired direction to the average power radiated from the antenna is called as _____

A Directivity
B Directive gain
C Power gain
D Partial directivity

2) If the length of the dipole decreases then the radiation resistance will _____

A Increase
B Decrease
C Depends on current distribution
D Not change

3) If charges +Q and -Q are existing in some medium then the electric field intensity will terminate at_____

A At origin
B At +Q
C At -Q
D At infinity

4) Using Stoke's theorem we convert _____ integration into _____ integration

A Line, surface
B Line, volume
C Single, triple
D Volume, line

5) $\nabla^2 V =$ ____is the Laplace's equation

A 0
B ∞
C $\frac{-\rho_v}{\epsilon}$
D $\frac{\rho_v}{\epsilon}$

6) Using boundary conditions, one can calculate _____ component.

A Tangential and normal
B Only tangential
C Only normal
D Sequential and Tangential

7) If the distance between the transmitting and receiving antenna is decreased by factor 2 while factors remain same, then the new power received by the antenna _____

A Increases by factor 2

B Decreases by factor 2
C Increases by factor 4
D Decreases by factor 4

8) Which of the following is true for circular polarization?

A $E_x = E_y \; and \; \varphi = \frac{\pi}{2}$

B $E_x = E_y \; and \; \varphi = \frac{\pi}{4}$

C $E_x \neq E_y \; and \; \varphi = \frac{\pi}{2}$

D $E_x \neq E_y \; and \; \varphi = \frac{\pi}{4}$

9) Gauss's law for the electric field is given by_____

A $\nabla . D = 0$

B $\nabla \, x \, D = \rho_v$

C $\nabla \, x \, D = 0$

D $\nabla . D = \rho_v$

10) In yagi Uda, the length of the director compared to the driven element is _____.

A Greater
B Smaller
C Independent to each other
D Depends on the type driven element

Q2) Solve any two. (20)

2a)Define maximum usable frequency and skip distance. Derive maximum usable frequency in terms of skip distance and virtual height.

2b) Write short note on parabolic reflector antenna. Describe feeding techniques of parabolic reflector array.

2c) State and explain Coulomb's law in electrostatics. A point charge Q1 = 2mC is located in free space at P1(-3,7,-4) while Q2 = 5 nC is at P2(2,4,-1). Find force on Q2 by Q1 and vice versa.

Q3) Solve any two

(20)

3a) Derive array factor of N-element linear array, where all elements are equally fed and spaced. Also find the expression for the position of principle maxima, nulls and secondary maxima.

3b) Discuss elctric field and magnetiv field boundary conditions at the interface of two mediums with relavant mathematical equations.

3c) Describe the space wave propagation and derive relation for maximum distance between transmitting and receiving antenna. Earth is assumed to be flat.

Q4) Solve any two. (20 marks)

4a) Derive Maxwell's equation in point form and integral form.
4b) Design a rectangular microstrip patch antenna with dimensions W and L over a single substrate whose center frequency is 2.4 GHz. The dielectric constant of the substrate is 4.4 and the height of the substrate is 1.6 mm. Determine the physical dimensions W and L (in cm) of the patch, taking into account fringing field.

4c) Describe what is fading. What are the different types of fading. Explain each of them in details.