Roll No												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

MAKEUP EXAMINATION – JAN 2023

Course Code: ECE-214
Course Name: Antenna and Microwave Engineering
Program : B.Tech

Date: 25-JAN-2023
Time: 01.00PM to 04.00PM
Max Marks: 80
Weightage: 40%

Instructions:

(i) Read the question properly and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non-programmable calculators are permitted.

Part A

Answer **all** the Questions. **Each** question carries **ONE** mark. (20Qx1M=20M)

1. The bandwidth of the antenna is inversely proportional to _____ of antenna
(a) P-factor (b) S-factor (c) F-factor (d) Q-factor

2. Directivity of large loop is_____
(a) $0.054(\frac{c}{\lambda})$ (b) $26(\frac{c}{\lambda})$ (c) $0.682(\frac{c}{\lambda})$ (d) $2.46(\frac{c}{\lambda})$

3. The formula for refractive index for ionized layers is
(a) $\sqrt{1+\frac{81N}{f^2}}$ (b) $\sqrt{1-\frac{81N}{f^2}}$ (c) $\sqrt{1+\frac{81N}{f}}$ (d) $\sqrt{1+\frac{81}{f^2}}$

4. Critical frequency of a layer is given by
(a) $f_c=81N_m$ (b) $f_c=81N_m^2$ (c) $f_c=9\sqrt{Nm}$ (d) $f_c=81\sqrt{Nm}$

5. Relation Between Maximum Usable Frequency and Skip Distance By considering the effect of Curvature of Earth, Where h= Virtual Height, R=Radius of Earth, D= Distance between Tx and Rx

(a) $D_{Skip}=2\left[\frac{D^2}{8R}\right]\sqrt{\left(\frac{f_{MUF}^2}{f_C^2}\right)-1}$ (b) $D_{Skip}=2\left[h+\frac{D^2}{8R}\right]\sqrt{\left(\frac{f_{MUF}^2}{f_C^2}\right)-1}$
(c) $D_{Skip}=2\left[h+\frac{D^3}{8R}\right]\sqrt{\left(\frac{f_{MUF}^2}{f_C^2}\right)-1}$ (d) $D_{Skip}=2\left[h+\frac{D^2}{8R}\right]\sqrt{\left(\frac{f_{MUF}^2}{f_C^2}\right)}$

6. Loops are extensively used in_____
(a)radio receivers (b)aircraft receivers (c)UHF Transmitters (d)all

7. In order to receive vertically polarized wave, the conductor of the dipole should be mounted
(a) Horizontal (b) Vertical (c) at an angle of 45^o (d) at an angle of 60^o

8. Relation between maximum aperture and directive is, where A_{em} = maximum aperture …..
(a)$D=\frac{4\pi}{\lambda}A_{em}$ (b)$D=\frac{4\pi}{\lambda^2}A_{em}$ (c)$A_{em}=4\pi$ (d) $A_{em}=4\pi^2$

9. VSWR is given by
(a) $\frac{v_{min}}{v_{max}}$ (b)) $\frac{v_i}{v_r}$ (c) $\frac{v_i}{v_r}$ (d) $\frac{v_{max}}{v_{min}}$

10. Power radiated per unit area in any direction is given by the pointing vector……..

(a) $P=\frac{E}{H}^2$ (b) $P=\frac{E}{H}$ (c) P=E*H (d) $P=\frac{E}{2H}^2$

11. The far field components of loop antennas is E_φ=_____

(a) $\frac{120\pi^2\,[I]\sin\theta A}{r\lambda^2}$ (b) $\frac{120\pi^2\,[I]\sin\theta A}{r}$ (c) $\frac{120\pi^2[I]\sin\theta A}{r\lambda}$ (d) $\frac{120\pi^2\,[I]\sin\theta A}{r\lambda^4}$

12. Distance between Transmitter and Receiver By considering the effect of Curvature of Earth, R=Radius of Earth, h= Virtual Height, β=Tangent Angle with respect to curvature of earth

(a) $2R\left[(90-\beta)-\sin^{-1}\left(\frac{R\cos\beta}{R+h}\right)\right]$ (b) $2R\left[(\beta)-\sin^{-1}\left(\frac{R\cos\beta}{R+h}\right)\right]$

(c) $2R\left[(90-\beta)-\sin^{-1}\left(\frac{R}{R+h}\right)\right]$ (d) $2R\left[(90-\beta)-\sin^{-1}\left(\frac{R\cos\beta}{2}\right)\right]$

13. Radiation resistance of small loop R_r is_____

(a)$197(\frac{c}{\lambda})^4$ (b) $200(\frac{c}{\lambda})^2$ (c) $400(\frac{c}{\lambda})^4$ (d) $497(\frac{c}{\lambda})^2$

14. MUF is given by

(a) MUF = $f_c\cos\theta$ (b) MUF = $f_c\sec\theta$ (c) MUF = $\frac{fc}{sec\theta}$ (d) MUF = $f_c\sec^2\theta$

15. Microstrip antenna is also known as

(a)Patch (b)Slot (c)Reflector (d) Logarithmic

16. …….defined as $2\pi*\frac{\text{total energy stored by antenna}}{\text{energy distributed per cycle}}$

(a)Q of antenna (b) Directivity (c) Band width (d) Gain

17. The reciprocity theorem can be used to drive the following….

(a) Equality of effective length (b) Equality of directive pattern

(c) Equality of directives (d) all of the above

18. Current distribution in very short dipole is____

(a) Constant (b) Sinusoidal (c) Triangular (d) Not Defined

19. Radiation resistance of current element is____

(a)$100(\frac{1}{\lambda})^2$ (b) $200(\frac{1}{\lambda})^2$ (c)$80\pi^2(\frac{dl}{\lambda})^2$ (d) none

20. Fading is nothing but

(a) Amplification of field (b) multiplication of field

(c) Subtraction of two fields (d) Change of field strength

Part B

Answer **all** the Questions. **Each** question carries **TEN** marks. (2Qx10M=20M)

21.(a) How the oscillating dipole generate harmonics waveforms? Explain with suitable diagrams

(b) With suitable diagrams explain HPBW and FNBW

22. (a) Explain the design and radiation pattern of corner reflector antennas with help of antenna images concept.

(b) Explain the geometrical properties of parabolic reflector antenna

Part C

Answer **all** the Questions. **Each** question carries **TEN** marks. (4Qx10M=40M)

23. Derive the Expression for refractive index (μ), if height above from the ground increases, how refractive index and free electron density will change.

24. Prove that for a wave guide the cutoff frequency $F_C=\frac{1}{2\pi\sqrt{\mu\varepsilon}}\sqrt{K_X^2 + K_Y^2}$, where

$\sqrt{K_X^2 + K_Y^2} = K_C$ =cutoff wave number.

25. (a) What is Skip Distance? With suitable diagrams explain how skip distance changes with respect to incident angle and time (day and night)

(b) Derive the relation between Maximum usable frequency, skip distance, and critical frequency by considering flat earth.

26. (a) Explain the motion of electron in Electric and Magnetic fields with suitable Equations.

(b) What is virtual height? How you measure virtual height with respect to flat earth consideration.