Reg. No.															

B.Tech(PT). DEGREE EXAMINATION, DECEMBER 2022

Second Semester

19PECC15T – ELECTROMAGNETICS AND TRANSMISSION LINES

(For the candidates admitted from the academic year 2019 – 2020)

(use Smith chart)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part - B** should be answered in answer booklet.

Time: 2½ Hours Max. Marks: 75

PART – A (25 × 1 = 25 Marks)

Answer **ALL** Questions

	Marks	BL	CO	PO
1. The force per unit charge can be represented by (A) Magnetic field intensity (B) Magnetic dipole (C) Electric field intensity (D) Electric dipole	1	1	1	2
2. $a_{r_1}, a_{\theta_1}, a_{\phi}$ are the unit vectors of (A) Elliptic (B) Circular cylindrical (C) Rectangular (D) Spherical	1	2	1	2
3. Which of the following describe the electric field intensity due to volume charge? (A) Div D = $\rho_L \rho_V$ (B) Div D = $\rho_S \rho_V$ (C) Div D = ρ_V (D) Div D = 0	1	1	1	2
4. Electric flux density in electric field is refereed to as (A) Number of flux lines (B) Ratio of flux lines crossing a surface and the surface area (C) Direction of flux at a point (D) Flux lines per unit area	1	2	1	2
5. At a point on the axis of an electric dipole (A) Electric field is zero (B) Electric potential is zero (C) Neither electric field and electric potential is zero (D) Electric field is directed perpendicular to the axis	1	2	1	2
6. Ampere's circuital law obeys (A) $H.dL = I$ (B) $\int E.dL = I$ (C) $\int J.dL = I$ (D) $\int D.dL = Q$	1	1	2	2
7. Relation between magnetic flux and magnetic flux density is (A) $B = \mu_O H$ (B) $D = eE$ (C) $D = 0$ (D) $D = \frac{\mu}{E}$	1	1	2	2

8. Biot savart law in magnetic field is analogous to which law in electric field? 1 2 2 2

(A) Gauss's law (B) Faraday's law
(C) Coulomb's law (D) Ampere's law

9. Find the Maxwell equation derived from faraday's law 1 2 2 2

(A) $DIV(H)=J$ (B) $DIV(D)=I$
(C) $CURL(E)=\frac{-dB}{dt}$ (D) $CURL(B)=\frac{-dH}{dt}$

10. Magnetic field can be produced by 1 1 2 2

(A) Conduction current (B) Displacement current
(C) Both conduction and displacement current (D) It is produced naturally

11. TE obyes the following 1 1 3 2

(A) $H_2=0$ (B) $E_2=0$
(C) $E_2=0$ and $H_2=0$ (D) $E_2\neq 0$ and $H_2\neq 0$

12. The wave impedance of a TM mode in a parallel plate waveguide is 1 2 3 2

(A) Function of frequency (B) Independent of frequency
(C) Proportional to square of frequency (D) Inversely proportional to square of frequency

13. The ratio of electric field intensity to magnetic field intensity between the parallel planes is 1 1 3 2

(A) Dominant mode (B) Cut-off frequency
(C) Wave velocity (D) Intrinsic impedance

14. The modes of propagation supported by a rectangular waveguide is 1 2 3 2

(A) TM, TE, TEM modes (B) TM, TE
(C) TM, TEM (D) TE, TEM

15. Waveguides are used mainly for microwave signals because 1 1 3 2

(A) They depend on straight-line propagation which applied to microwaves only (B) Losses would be too heavy at lower frequencies
(C) There are no generators powerful enough to excite them at lower frequencies (D) They would be too bulky at lower frequencies

16. Choose the correct option for SWR with respect to reflection coefficient 1 1 4 2

(A) $\frac{1+|\Gamma|}{1-|\Gamma|}$ (B) $\frac{1-|\Gamma|}{1+|\Gamma|}$
(C) $\frac{1}{1-|\Gamma|}$ (D) $1+|\Gamma|$

17. The ratio maximum voltage (E_{max}) to the minimum voltage can be defined as 1 2 4 2

(A) Loading (B) Standing wave ratio
(C) Reflection co-efficient (D) Shorted lines

18. Which of the following parameter is not a primary parameter in a transmission line? 1 2 4 2

(A) Resistance (B) Attenuation constant
(C) Capacitance (D) Conductance

19. The open circuit impedance of the transmission line is given by 1 2 4 2

(A) $Z_{oc} = jz_0 \tan\beta l$ (B) $Z_{oc} = -jz_0 \tan\beta l$
(C) $Z_{oc} = jz_0 \cot\beta l$ (D) $Z_{oc} = -jz_0 \cot\beta l$

20. The standing wave ratio in short and open circuit transmission lines will be 1 1 4 2

(A) 0 (B) –1
(C) 1 (D) ∞

21. Choose the location where which we cannot connect the single stub for impedance matching 1 1 5 2

(A) Between E_{min} and load (B) At E_{min}
(C) At the place which is having the value of conductance $\frac{1}{R_0}$ (D) Between E_{min} and source

22. The length of the quarter wave impedance transformer is 1 2 5 2

(A) $\frac{\lambda}{1}$ (B) $\frac{\lambda}{4}$
(C) $\frac{\lambda}{8}$ (D) $\frac{3\lambda}{4}$

23. One of the following is not an advantage of impedance matching 1 2 5 2

(A) Standing wave ratio =0 (B) Efficiency of transmission line is high
(C) Non-resonant (D) Standing wave ratio = 1

24. The smith chart consists of the 1 1 5 2

(A) Constant R and variable X circles (B) Variable R and constant X circles
(C) Constant R and constant X circles (D) Variable R and variable X circles

25. Moving towards the clockwise direction in the smith chart implies moving 1 2 5 2

(A) Towards generator (B) Towards load
(C) Towards stub (D) Towards waveguide

PART – B (5 × 10 = 50 Marks)
Answer **ALL** Questions

		Marks	BL	CO	PO
26. a.	Using Gauss's law, derive the concept of divergence in rectangular co-ordinate system.	10	3	1	2
	(OR)				
b.	Explain about electric field intensity and also derive the expression for electric field intensity due to sheet and volume charge distributions.	10	4	1	2
27. a.	Explain and derive the energy density in electrostatic field.	10	4	2	2
	(OR)				
b.	Analyze the faraday's law under the variations of magnetic flux lines and closed path dimensions and also explain about motional emf.	10	4	2	2
28. a.	Obtain the E and H field components for a rectangular waveguide.	10	3	3	2
	(OR)				
b.	Explain plane waves in lossless dielectric, free space and good conductors.	10	4	3	2
29. a.	Point out the condition for distortionless line. Also derive the expression for characteristics impedance (Z_0) for the same.	10	4	4	2
	(OR)				
b.	Obtain the expression for input impedance for open and short circuited transmission line condition.	10	3	4	2
30. a.	Write short notes on impedance measurement using slotted line and quarter wave transformer.	10	3	5	2
	(OR)				
b.	A load of $100 + j150\Omega$ is connected to a 75Ω lossless line. Use smith chart to find (i) Γ (ii) S (iii) Y_L (iv) Z_{in} at 0.4λ from the load	10	4	5	2

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