Reg. No.														

B.Tech(PT). DEGREE EXAMINATION, FEBRUARY 2023
Second Semester

19PECC15T – ELECTROMAGNETICS AND TRANSMISSION LINES
(For the candidates admitted from the academic year 2019 – 2020 onwards)

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 law deals with the force that a point charge exerts on another point charge (A) Coulomb's law (B) Gauss's law (C) Biot-savart law (D) Ampere's circuital law	1	1	1	2
2. The electric field E is given by (A) $E=\nabla V$ (B) $E=-\nabla V$ (C) $E=(\nabla.\nabla)V$ (D) $E=-(\nabla.\nabla)V$	1	2	1	2
3. a_r, a_θ, a_ϕ are the unit vectors of (A) Elliptic (B) Circular cylindrical (C) Rectangular (D) Spherical	1	1	1	2
4. The electric field intensity due to line charge is (A) $E=\frac{\rho_L}{2\pi\varepsilon_0 r}.a_r$ (B) $E=\frac{\rho_S}{2\pi\varepsilon_0 r}.a_r$ (C) $E=\frac{\rho_L}{2\varepsilon_0}$ (D) $E=\frac{\rho_S}{2\varepsilon_0}$	1	2	1	2
5. Electric flux density in electric field is referred 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	1	1	2
6. Ampere's circuital law obeys (A) $\oint H.dL=I$ (B) $\int E.dL=I$ (C) $\int J.dL=I$ (D) $\int D.dV=I$	1	2	2	2

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

	Marks	BL	CO	PO
26. a. Explain about electric field intensity and also derive the expression for electric field intensity due to infinite line charge.	10	4	1	2
(OR)				
b. Illustrate with a neat sketch, derive the expression for electric field intensity due to dipole.	10	3	1	2
27. a. Using Biot Savart's law principle, derive the expression for magnetic field intensity due to infinitely long straight conductor.	10	3	2	2
(OR)				
b. Explain and derive maxwell's equations for time varying fields in point and integral form.	10	4	2	2
28. a. Explain plane waves in lossless dielectric, free space and good conductors.	10	4	3	2
(OR)				
b. With a neat sketch of rectangular waveguide, derive the field components of transverse electric (TE) mode of propagation in rectangular waveguide.	10	3	3	2
29. a. Point out the primary parameters of the transmission line and also derive the general solution of transmission line.	10	4	4	2
(OR)				
b. Derive the expression for input impedance of open and short circuited lines and sketch the variation of reactance as a function of distance.	10	3	4	2
30. a. With neat sketch explain single stub impedance matching and also derive an expression for location and length of the stub.	10	3	5	2
(OR)				
b. Construct a stub to match a transmission line which is connected to a load impedance of $Z_L=(450-j600)\Omega$ $Z_0=300\Omega$ and operating frequency is 20 MHz. (Using Smith chart).	10	4	5	2

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7. Relation between magnetic flux and magnetic flux density is — 1 1 2 2
   (A) $B=\mu_0 H$ (B) $D=eE$
   (C) $D=\frac{Q}{V}$ (D) $D=\frac{\mu}{\varepsilon}$

8. Biot savart law in magnetic field is analogous to which law in electric field — 1 1 2 2
   (A) Gauss's law (B) Faraday law
   (C) Coulomb's law (D) Ampere's law

9. One of the following cannot be computed using the biot savart law — 1 2 2 2
   (A) Magnetic field intensity (B) Magnetic flux density
   (C) Electric field intensity (D) Permeability

10. As per faraday's law of electromagnetic induction, an e.m.f is induced in a conductor whenever it — 1 2 2 2
   (A) Lies perpendicular to the magnetic flux (B) Lies in a magnetic field
   (C) Cuts magnetic flux (D) Moves parallel to the direction of the magnetic field

11. TE waves obeys the following — 1 1 3 2
   (A) $H_z=0$ (B) $E_z=0$
   (C) E_z and $H_z=0$ (D) E_z and $H_z\neq 0$

12. The wave impedance of a TM mode in a parallel plate waveguide is a — 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) Cutoff frequency
   (C) Wave velocity (D) Intrinsic impedance

14. The modes of propagation supported by a rectangular waveguide is — 1 2 3 2
   (A) TM, TEM, TE 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 applies 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. One of the following combination is correct with respect to transmission line — 1 2 4 2
   (A) R in series with L, G is in parallel with C (B) R in series with L, G is in series with C
   (C) R in parallel with L, G is in series with C (D) R in parallel with L, G is in parallel with C

17. Characteristics impedance of transmission line is denoted by — 1 1 4 2
   (A) Z_0 (B) I_0
   (C) Y_0 (D) B_0

18. Reflection coefficient can be represented as — 1 2 4 2
   (A) $\frac{S-1}{S+1}$ (B) $\frac{S+1}{S-1}$
   (C) $\frac{1}{S+1}$ (D) $\frac{1}{S-1}$

19. One of the following expression is applicable for standing wav ratio — 1 2 4 2
   (A) E_{min}/E_{max} (B) E_{max}/E_{min}
   (C) $E_{max}/(I_{min}-1)$ (D) $(I_{max}+1)/E_{min}$

20. Estimate the value of Z_0, if $Z_{SC}=600\Omega$, and $Z_{OC}=750\Omega$ — 1 1 4 2
   (A) 650.82 (B) 670.82
   (C) 630.82 (D) 690.82

21. The value of conductance at the point of connecting the stub should be — 1 1 5 2
   (A) 0 (B) ∞
   (C) 1 (D) 10

22. 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 ratio =1

23. The length of the quarter wave transformer is — 1 1 5 2
   (A) $\frac{\lambda}{1}$ (B) $\frac{\lambda}{4}$
   (C) $\frac{\lambda}{8}$ (D) $\frac{3\lambda}{4}$

24. The smith chart consists of the — 1 2 5 2
   (A) Constant R and variable X circles (B) Variable R and constant X circles
   (C) Constant R and constant X circles (D) Variables R and variable X circles

25. Moving towards the clockwise direction in the smith chart implies moving — 1 1 5 2
   (A) Towards generators (B) Towards load
   (C) Towards stub (D) Towards waveguide