**Total No. of Questions :8]**

## **[6262]-94**

**PB3832 [Total No. of Pages : 3**]

**SEAT No. :**

**T.E.(Electronics & Telecommunication) ELECTROMAGNETIC FIELD THEORY (2019 Pattern)(Semester** -**I)(304182)** (2019 Patte)<br>  $[ours]$ <br>
to the candidates:<br>  $[ours]$ <br>  $[oures]$ <br>  $[ou$ 9. of Questions :8|<br>
32 [6262]-94<br>
T.E. (Electronics & Telecom<br>
ELECTROMAGNETIC FIE<br>
(2019 Pattern) (Semester<br>  $\frac{1}{2}$  Hours]<br>
ions to the candidates:<br>
Solve Q.No.Tor Q.No.2, Q.No.3 or Q.No.4, Q<br>
Figures to the right si

*Time : 2½ Hours] [Max. Marks :70 Instructions to the candidates:*

- *1) Solve Q.No.1or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No8.*
- *2) Figures to the right side indicate full marks.*
- *3) Assume suitable data, if necessary.*
- *Q1)* a) Derive the boundary condition between Conductor and Free space for static electric field. **[8]** 
	- b) Derive an expression for energy stored and energy density in electrostatic field. **[9]** OR
- *Q2)* a)  $\overline{\triangledown}$  for a parallel plate capacitor area of plate  $A=12$  cm<sup>2</sup> spacing between plates d=5 mm, separated by dictectric of  $\varepsilon$  = 12, connected to a 40 V battery find: Capacitance, Electric field intensity E, flux density D and an energy stored in the capacitor. **[8]** OR<br>
expaction area of plans<br>
parated by dictectric distance, Electric field<br>
the capacitor,<br>
principal which<br>  $\frac{1}{3}\mu r_2 = 4$ ,  $H_1 = 30$  a
- b) Region-1 is semi-infinite space in which  $2x-5y > 0$ , while for region-2,  $2x-5y<0$ . Let  $\mu r_1 = 3$ ,  $\mu r_2 = 4$ , H<sub>1</sub>=30 a<sub>x</sub><sup>3</sup> A/m. Find B<sub>1</sub>, H<sub>12</sub>, H<sub>N2</sub>and H<sub>2</sub>. (Magnetic flux density in region 1-B<sub>1</sub>, Tangential component of Magnetic field intensity in region  $2 - H_{12}$ , Normal component of Magnetic field intensity in region  $2\frac{H_{N2}}{2}$  and Magnetic field intensity in region  $2\frac{H_{2}}{2}$ . [9] mdary condition between Conductor and leads<br>
eld.<br>
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Solate capacitor area of plate A=12 cm<sup>2</sup> spa<br>
plate capacitor area of plate A=12 cm<sup>2</sup> spa<br>
plate capacitor area of plate A=12 cmne<br>
ppacitance, Electric field int
- *Q3)* a) State and explain Maxwell's equations for time varying field in detail.
- b) State and explain the Faradays ' law and Lenz's law with suitable example. **[8]** Solid to the varying field<br>aw and Lenz's law<br>leetric constant of ic<br>leetric constant of ic

OR

At frequency of 3000 MHz, the dielectric constant of ice made from pure water has values of 3.20, while the loss tangent is 0.0009. If a uniform plane wave with a amplitude of 100  $\sqrt{m}$  at  $z = 0$  is propagating through such ice, find the time-average power density at  $z = 0$  and  $z = 10$ m for the given frequency. **[8]** 1 which  $2x - 3y > 0$ , while for region-2,<br>  $x = 30$  a,  $x^2$  A/m. Find B<sub>1</sub>,H<sub>12</sub>,H<sub>N2</sub> and H<sub>2</sub>,<br>  $-$ B<sub>1</sub>, Tangential component of Magnetic-Geld<br>
netic field intensity in region 2.4H<sub>2</sub>). [9]<br>
tions for time varying field

*P.T.O.*

**[10]**

b) Let  $\mu = 10^{-5}$  H/m = 4 × 10<sup>-9</sup>F/m,  $\sigma \approx 0$ , and  $\rho v = 0$ . Find k (including units) so that each of the following pairs of fields satisfies Maxwell's equations:

(i) D = 6a*<sup>x</sup>* -2y a*<sup>y</sup>* +2z a*z* nC/m2 , H =kx a*<sup>x</sup>* +10y ay - 25z az A/m; (ii) E = (20ykt)a*<sup>x</sup>* V/m, H=(y+2×106 t)a*<sup>z</sup>* ––-utyyy f{[][dsdfdfcvv[9] Jhdijsdjhhsdhjshyyutyu[[[szdsdsxfdgfg

A/m. **[10]**

- *Q5)* a) Derive the Helmholtz Wave Equation in terms of electric field intensity and magnetic field intensity for the charge free region. **[8]**
- b) A 9.375-GHz unifrom plane wave is propagating in polyethylene with  $\epsilon = 2.26$ ,  $\mu_r = 1$ . If the amplitude of the electric field intensity is 500 V/m and the material is assumed to be lossless, find: **[10]** [10]  $u_r = 1$ . If the amplitude of the electric field interial is assumed to be lossless, find.<br>
exercise in the polyethlene<br>
ity of propagation<br>
sic impedance<br>
tude of the magic field intensity.<br>
Six: Phase velocity, Group Vel (1) E = (20y-kt)a, V/r<br>
Derive the Helmholtz<br>
nd magnetic field inte<br>
A 9.375-GHz unifron<br>
with  $\epsilon = 2.26$ ,  $\mu_r = 1$ . Let  $\mu = 10^{-5}$  H/m = 4 × 10<sup>-9</sup>F/m,  $\sigma = 0$ ,<br>units) so that each of the following pa<br>equations:<br>(i) D = 6a<sub>x</sub>-2y a<sub>y</sub>+2z a<sub>z</sub> nC/m<sup>2</sup>,  $H = kx$  a<sub>x</sub><br>(ii) E = (20y-kt)a<sub>x</sub>V/m,  $H=(y+2\times10^{6}t)$ ;<br>Derive the Helmholtz Wave Equ
	- i) The phase constant
	- ii) The wavelength in the polyethlene
	- iii)<sup>The velocity of propagation</sup>
	- iv) The intrinsic impedance
	- $\sqrt[n]{v}$  The amplitude of the magic field intensity.
- *Q6)* a) Define the terms: Phase velocity, Group Velocity, propagation constant, wavelength and intrinsic impedance. mpedance<br>
of the magic field int<br>
CR<br>
hase velocity, Group<br>
rinsic impedance.

OR

- b) Derive the expression for reflection coefficient and transmission coefficient for normal incidence of uniform plane wave. **[10]**
- *Q7*) a) A lossless transmission line with  $Z_0 = 75 \Omega$  is 30m long and operates at 2MHz. The line is terminated with a load  $Z_{\text{I}}=90 + 160 \Omega$ . If velocity u=0.6c on the line, where C is velocity of light using Smith chart **[10]** =75  $\Omega$  is 30m long and<br>a load  $Z_L$ =90  $\rightarrow$  60  $\Omega$ <br>y of light using Smith<br>and Cega is 300 to 60  $\Omega$ <br>where the small stars of transfer than  $Z_0 = 75 \Omega$  is 30m long and operates at<br>the a load  $Z_1 = 90 - 60 \Omega$ . If velocity<br>ocity of light using Smithchart [10]<br>condary constants of transmission<br>condary constants of transmission [7]
	- i) Reflection coefficient
	- ii) Standing wave ratio
	- iii) Input impedance
	- iv) Load admittance
	- State and explain primary and secondary constants of transmission  $\sum$  [7]

**[6262]-94 2**

**[6262]-94 3** *Q8)* a) A generator of 1v, 1 KHz supplies power to a 100 Km open wire transmission line terminated  $ip$  Z0. The line parameters are,  $R=10.4 \Omega/Km$ , L=0.00367 H/Km, G=0.8×10<sup>-6</sup> mho/Km, C=0.00835×10-6 F/Km. Calculate  $Z_0 \alpha, \beta, \lambda$ , and velocity (v). b) Derive general, soution of transmission line. Also explain its physical significance. **[8]** Derive general, soution of transmission line<br>ignificance. Case Co. 2009 1300 C 49.21 March 1988 Static 238 Static A generator of 1v, 1 KHz supplies-<br>transmission line terminated tip<sup>2</sup>Z<br>R=10.4 $\Omega$ /Km, L=0.00367 H/Km,<br>C=0.00835×10<sup>-6</sup> F/Km.<br>Calculate Z<sub>0</sub> $\alpha$ , $\beta$ , $\lambda$ , and velocity (v).<br>Derive general, soution of transmission<br>signifi CEGRO 13091 49.21.26.2000 13.38.2000 13.38.2000 13.38.2000 13.38.2000 13.38