

Total No. of printed pages = 4

19/5th Sem/DECE514A

2021

**ELECTROMAGNETIC WAVES AND
APPLICATIONS**

Full Marks – 100

Pass Marks – 30

Time – Three hours

The figures in the margin indicate full marks
for the questions.

Answer any *five* questions.

1. (a) Write down the physical significance of
divergence and curl. 5
- (b) Write down the properties of cross-product.
3
- (c) What are Position vector and Distance
vector? 2
- (d) Given points P (1, -3, 5), Q (2, 4, 6) and
R (0, 3, 8), find : 5+3+2=10
 - (i) the position vectors of P and R
 - (ii) the distance vector r_{QR}
 - (iii) the distance between Q and R.

[Turn over

2. (a) What does orthogonal system mean? 2
- (b) How many orthogonal systems are there? Discuss each of them by presenting a vector 'A' in different orthogonal systems. $1+9=10$
- (c) Given point P (-2, 6, 3) and vector $A = ya_x + (x+z)a_y$, express P in cylindrical and spherical co-ordinates and A at point P in Cartesian co-ordinate system. $3+3+2=8$

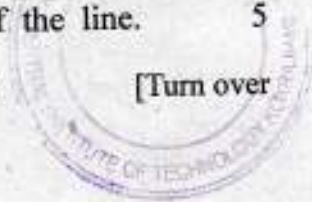
3. (a) State and explain the Coulomb's law. 3
- (b) Find out the expression of electric field at a point (without using Gauss's law) for a uniformly charged sheet and also shows that the electric field does not depend on the distance between the sheet and the observation point. $8+2=10$
- (c) State and explain Gauss's law in electrostatics. 3
- (d) Using Gauss's law derived the expression of electric field for a uniformly charged sheet. 4

4. (a) State and derive the expression of Ampere's circuit law in point form. $2+4=6$

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- (b) Derive the Modified Ampere's circuit law and discuss about the displacement current. $7+3=10$
- (c) Write down the point form of Maxwell's equations. 4
5. (a) Derive the boundary conditions of electric field and magnetic field. $4+4=8$
- (b) Derive the expression of wave equation of a medium which contains no free charge. 6
- (c) Define and derive the expression of skin depth and loss tangent. $3+3=6$
6. (a) What are the line parameters? 2
- (b) What is distortion less line? What is the condition a transmission line become a distortion less line? $2+1=3$
- (c) What is Characteristic Impedance of a transmission line? 2
- (d) An air line has characteristic impedance of $70\ \Omega$ and phase constant 3rad/m at $100\ \text{MHz}$. Calculate the inductance per meter and the capacitance per meter of the line. 5



(e) What is Smith Chart? How many different circles are there? $2+2=4$

(f) A lossless 60Ω line is terminated by a $(60+j60)\Omega$ load. 4

Find :

(a) reflection coefficient Γ

(b) Standing wave ratio S.

