VIT
Vellore Institute of Technology

SCHOOL OF ELECTRONICS ENGINEERING
Continuous Assessment Test 1
B Tech (ECE), Fall Semester 2019-20

Course Code	: ECE1003	Duration: 90 mins
Course Name	: Electromagnetic Field Theory	Max Marks: 50
Slots	: F1+TF1	

1. Transform the **H** into spherical coordinate system. Also in the transformed system determine the vector at (3, -4, 5). (10)

$$\mathbf{H} = xy^2z\,\mathbf{a}_x + x^2yz\,\mathbf{a}_y + xyz^2\,\mathbf{a}_z$$

2. (i) A point charge 100 pC is located at (4,1,-3) while the x-axis carries charge 2 nC/m. If the plane z = 3 also carries 5 nC/m^2, Find **E** at (1,2,3). (5)

(ii) Determine the curl of the following vector. (5)

$$\mathbf{T} = \frac{1}{r^2}\cos\theta\,\mathbf{a}_r + r\sin\theta\cos\Phi\,\mathbf{a}_\theta + \cos\theta\,\mathbf{a}_\Phi$$

3. (i) Given that the electric filed in a certain region is $\mathbf{E} = (z+1)\sin\Phi\,\mathbf{a}_\rho + (z+1)\cos\mathbf{a}_\varphi + \rho\sin\varphi\,\mathbf{a}_z$ V/m. Determine the work done in moving a 4 nC charge from A (4, 30°,0) to B (4, 30°, -2). (6)

(ii) Determine the $\vec{E}$ due to the potential $V = x^2 + 2y^2 + 4z^2$ (4)

4. Verify divergence theorem for the vector $\mathbf{A} = 2\rho z\,\mathbf{a}_\rho + 3z\sin\Phi\,\mathbf{a}_\Phi - 4\rho\cos\Phi\,\mathbf{a}_z$ and *S* is the surface of the wedge $0 < \rho < 2$, $0 < \theta < 45°$, $0 < z < 5$. (10)

5. Three concentric spherical shells r = 1m, r = 2m and r = 3m respectively have charge distribution 2 μC/m^2, - 4 μC/m^2 and 5 μC/m^2. (10)
   (i) Calculate the flux through r =1.5m and r =2.5m.
   (ii) Find D at r = 0.5m, r = 2.5m and r =3.5m.