**Birla Institute of Technology & Science, Pilani – K K Birla Goa Campus**
**I Semester 2019-2020**
**ECE F314 Electromagnetic Fields and Microwave Engineering**
**Mid Semester Exam (Closed Book)**
**Date: - 30-09-2019 Max Time: 1hr 30 Min Max. Marks: 60**

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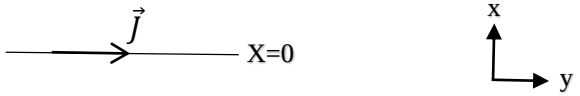
|---|---|---|
| Q. 1 | A parallel plate air-filled capacitor has plate area of $10^{-4}\,m^2$ and plate separation of $10^{-3}$ m. it is connected to a 0.5 V, 3.6 GHz source. Calculate the magnitude of displacement current. ($\varepsilon_0 = \frac{1}{36\pi} * 10^{-9}\ F/m$ ) | 10 |
| Q. 2 | A current sheet $\vec{J}$ = 10 $\hat{u}_y$ A/m lies on the dielectric interface x = 0 between two dielectric media with $\varepsilon_{r1}$= 1, $\mu_{r1}$ = 1 in region -1 (x < 0), and $\varepsilon_{r2}$= 2, $\mu_{r2}$ = 2 in region -2 (x > 0). If the magnetic field in region-1 at $x = 0^-$ is $\overrightarrow{H_1}$ = 3 $\hat{u}_x$ + 30 $\hat{u}_y$ A/m. what will be the magnetic field in region-2 at $x = 0^+$.   | 10 |
| Q. 3 | The region Z< 0 is characterized by $\varepsilon_r = \mu_r = 1$ and $\sigma = 0$. The total electric field here is given by $E_s = 150\, e^{-j10z}\, \hat{u}_x + 50 \angle 20^0\, e^{j10z}\, \hat{u}_x$ V/m. what is the intrinsic impedance for the region Z > 0. | 5 |
| Q. 4 | Region 1, Z<0 and Region 2, Z>0, are both perfect dielectrics. A uniform plane wave travelling in the $u_z$ direction has a frequency of 3 x $10^{10}$ radian/sec. Its wavelength in the two regions are $\lambda_1$ = 5 cm and $\lambda_2$ = 3 cm. Find the following<br>(a) The energy reflected (in Percentage) from the boundary.<br>(b) SWR. | 10 |
| Q. 5 | Mark following points on smith chart: ($Z_0$ = 50 ohm)<br>(a) Z= 150+j100, find corresponding reflection coefficient ($\Gamma$)<br>(b) Given Y = 10-j40 mili-mho, Mark corresponding Impedance (Z) from smith chart.<br>(c) VSWR = 2 , $\angle\Gamma = 120^0$<br>(d) Short circuit point and Open circuit Point. | 10 |
| Q. 6 | A uniform plane wave $E_i = (10\hat{u}_x + 4\hat{u}_y - 8\hat{u}_z)\, e^{-j4\pi(2y+z)}$ is incident on a dielectric-conductor interface (Y= 0 Plane). Calculate<br>(a) The angle of incidence<br>(b) Wave number or phase constant (**k**)<br>(c) Reflected electric field ($\mathbf{E_r}$). | 10 |
| Q. 7 | A 50Ω transmission line is connected to a parallel combination of 100Ω resistance and 1 nF capacitance. Find VSWR on the line at a frequency of 2 MHz, Also find maximum and minimum resistance observed on the line. | 5 |