**B**                                   **B7034**

Reg No.:_____                Name:_____

### APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

**Course Code: EC303**

**Course Name: APPLIED ELECTROMAGNETIC THEORY (EC)**

Max. Marks: **100**                                        Duration: 3 Hours

*Smith Chart to be supplied on request.*

**PART A**

*Answer any two full questions, each carries 15 marks.*

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| 1 | a) | Derive the expressions for Energy stored in Electric Field. | (8) |
| | b) | Eight identical charges,Q each are placed on the corners of a cube of side 'a'. Find the resultant force on a charge. | (7) |
| 2 | a) | Derive Maxwell's first and second equations from fundamental laws. | (8) |
| | b) | Starting from Maxwell equation, derive the wave equation for a conducting medium. | (7) |
| 3 | a) | Determine the inductance of a Two- wire transmission line. | (5) |
| | b) | A Parallel plate capacitor with plate area of $5cm^2$ and a plate separation of 3mm has a voltage $50\sin10^3t$ Volt applied to its plates.Calculate the displacement current assuming $\varepsilon = 2\varepsilon_0$. | (4) |
| | c) | Derive the boundary conditions for electric field at the interface of two dielectrics. | (6) |

**PART B**

*Answer any two full questions, each carries 15 marks.*

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|---|---|---|---|
| 4 | a) | State Poynting theorem. Derive the equation of complex vector. | (8) |
| | b) | A lossless 50-$\Omega$ transmission line is terminated in a load with $Z_L = (50+ j25)\ \Omega$. Calculate (i) The reflection coefficient $\Gamma$. (ii) The standing-wave ratio. | (7) |
| 5 | a) | Derive the input impedance of a transmission line. For a shorted section of 75 ohm transmission line, $l = \lambda/4$, Find the input impedance assuming $\alpha =0$. | (7) |
| | b) | Differentiate circular and elliptical polarization. | (8) |
| 6 | a) | Derive standard Transmission line equations. | (6) |
| | b) | Derive Brewster angle.A parallel-polarized plane wave is incident from air onto a dielectric medium with $\varepsilon r = 9$ at the Brewster angle. What is the refraction angle? | (9) |

**PART C**

*Answer any two full questions, each carries20 marks.*

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|---|---|---|---|
| 7 | a) | A lossless transmission line with $Z_0=50\Omega$ is 30m long and operates at 2MHz. The line is terminated with a load $Z_L=60+j40\Omega$. If u=0.6c on the line, find i)Reflection coefficient ii) Standing wave ratio iii) Input impedance | (15) |
| | b) | Discuss the attenuation of waveguides. | (5) |
| 8 | a) | Explain single stub matching in detail using analytical method. | (12) |
| | b) | Explain Group velocity and Phase velocity. When a wave of 6GHz propagates in parallel conducting plates separated by 3cm, find the $V_P$ and $V_g$of the wave for dominant wave. | (8) |
| 9 | a) | Explain waveguides and its different modes of wave propagation. | (10) |
| | b) | Explain Half Wave and Quarter Wave Transmission lines. Given that $Z_L=30+j40\Omega$, $Z_0=50\Omega$. Find the shortest length ('*l*') and point where stub has to be placed for a matching. (Use Smith chart) | (10) |

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