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Roll No.....

FIFTH SEMESTER

B.Tech. (Engineering Physics)

SUPPLEMENTARY EXAMINATION

FEBRUARY 2019

EP 303(New Scheme) : **ELECTROMAGNETIC THEORY, ANTENNA &**

PROPAGATION

Time : 3.00 Hrs

Max. Marks : 40

Note : Attempt any five Questions

Assume suitable missing data, if any

- 1.(a) Explain with schematic diagram (4)
(i) Reflection Coefficient (ii) Transmission Coefficient .
- (b) What are the applications of Smith Chart?. Explain (i) Single stub matching (ii) double stub matching. (4)
- 2.(a) Using Maxwell's equations derive the electric and magnetic wave equations, $\nabla^2 \vec{E} = \gamma^2 \vec{E}$ and $\nabla^2 \vec{H} = \gamma^2 \vec{H}$, where $\gamma = \sqrt{j\omega\mu(\sigma + j\omega\epsilon)} = \alpha + j\beta$ is the intrinsic propagation constant of a medium. (4)
- (b) What do you understand by the terms- cutoff wavelength, dominant mode, guide wavelength, phase velocity, group velocity and wave impedance for rectangular waveguides. (4)
- 3.(a) Write the Maxwell's equations in differential and integral form. Also give their physical significance. (4)
- (b) Differentiate between waveguides and two wire transmission lines with example. (4)
- 4.(a) What is an antenna arrays? Show that the normalized array factor is a function of the geometry of the array and the excitation phase. (4)
- (b) What do you mean by (i) Radiation resistance (ii) Directivity (iii) Effective Area (iv) Half-Power Beam Width of an antenna. (4)
- 5.(a) What do you mean by (i) ground waves, (ii) space waves, and (iii) sky waves (4)
- (b) Discuss briefly the propagation of electromagnetic waves in ionosphere. Show that ionosphere behave as a medium of refractive index

$$n = \left(1 - \frac{81N}{f^2} \right)^{1/2} \quad (4)$$

- 6.(a) An air-filled rectangular waveguide of inside dimensions 6x4 cm operates in the dominant TE₁₀ mode. (4)
- (i) Find the cutoff frequency (ii) Determine the phase velocity of the wave in the guide at a frequency of 4GHz (iii) Determine the guide wavelength at the same frequency.
- (b) Show that the ratio of the cross-section of a circular waveguide to that of a rectangular one $A_c/A_r = 2.17$ if each is to have the same cutoff wavelength for its dominant mode. (4)