

CBGS SCHEME

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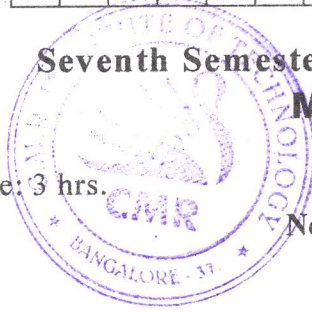
15EC71

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019 Microwaves and Antennas

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing
ONE full question from each module.



Module-1

- Derive the general transmission line equation to find voltage and current on the line in terms of position 'z' and time 't'. (07 Marks)
 - Describe the different mode curve in the case of reflex klystron. (05 Marks)
 - A transmission line has a characteristic impedance of $50 + j0.01\Omega$ and terminated in a load impedance of $73 - j42.5\Omega$ calculate : i) reflection coefficient ii) SWR. (04 Marks)

OR

- Define reflection coefficient. Derive the equation for reflection coefficient at the load end at a distance 'd' from the load. (06 Marks)
 - Describe the mechanism of oscillation of reflex klystron. (06 Marks)
 - A transmission line has the following parameters : $R = 2\Omega/m$, $G = 0.5\text{mmho}/m$, $f = 1\text{GHz}$, $L = 8\text{nH}/m$, $C = 0.23\text{pF}/m$. Calculate : i) characteristic impedance ii) propagation constant. (04 Marks)

Module-2

- State and explain the properties of S - matrix. (07 Marks)
 - With a neat diagram, explain the working of precession type variable attenuator. (06 Marks)
 - A 20mW signal is fed into one of the collinear ports of a lossless H-plane T junction. Calculate the power delivered through each port when other ports are terminated in matched load. (03 Marks)

OR

- What is magic Tee? Derive its scattering matrix. (06 Marks)
 - Discuss different types of coaxial connectors. (04 Marks)
 - 2 transmission lines of characteristic impedance Z_1 and Z_2 are joined at plane PP'. Express S-parameters in terms of impedance when each line is matched terminated. (06 Marks)

Module-3

- Explain the construction and field pattern for microstrip line. (06 Marks)
 - Explain the following terms as related to antenna system :
 - directivity
 - beam efficiency
 - effective aperture.(06 Marks)
 - The effective apertures of transmitting and receiving antennas in a communication system are $8\lambda^2$ and $12\lambda^2$ respectively. With a separation of 1.5km between them. The EM wave travelling with frequency of 6 MHz and the total input power is 25KW. Find the power received by the receiving antenna. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, $42+8=50$, will be treated as malpractice.

OR

- 6 a. Explain co-planar strip line and shielded strip line. (06 Marks)
 b. Write a note on antenna field zones. (06 Marks)
 c. An antenna has a field pattern given by $E(\theta) = \cos^2\theta$ for $0 \leq \theta \leq \pi/2$. Find the beam area and directivity. (04 Marks)

Module-4

- 7 a. Derive an expression and draw the field pattern for an array of 2 isotropic point sources with same amplitude and phase spaced $\lambda/2$ apart. (06 Marks)
 b. Show that the radiation resistance of $\lambda/2$ antenna is 73Ω . (06 Marks)
 c. A source has a radiation intensity power pattern given by $U = U_m \sin^2\theta$ for $0 \leq \theta \leq \pi$; $0 \leq \phi \leq 2\pi$. Find the total power and directivity. Draw pattern. (04 Marks)

OR

- 8 a. Derive the expressions for the far field components of short dipole. (06 Marks)
 b. Explain the principle of pattern multiplication with an example. (06 Marks)
 c. A source has a cosine radiation intensity pattern given by $U = U_m \cos\theta$ for $0 \leq \theta \leq \pi/2$ and $0 \leq \phi \leq 2\pi$. Find the total power and directivity. (04 Marks)

Module-5

- 9 a. Derive the expression for strength E_ϕ and H_θ in case of small loop. (06 Marks)
 b. Explain the working and design considerations of Log-periodic antenna. (06 Marks)
 c. A 16-turn helical beam antenna has a circumference of λ and turn spacing of $\lambda/4$. Find : (04 Marks)
 i) HPBW ii) axial ratio iii) directivity.

OR

- 10 a. Show that the radiation resistance of small loop is $31171 \left(\frac{A}{\lambda^2}\right)^2$. (05 Marks)
 b. Write a short notes on : (06 Marks)
 i) Yagi Uda array ii) parabolic reflector.
 c. Determine the length L , H-plane aperture and flare angles θ_E and θ_H of a pyramidal horn for which the E-plane aperture $a_E = 10\lambda$. Let $\delta = 0.2\lambda$ in the E-plane and 0.375λ in the H-plane. Also determine beam widths and directivity. (05 Marks)
