CBCS SCHEME

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18EC63

Sixth Semester B.E. Degree Examination, June/July 2023
Microwave and Antenna

Time: 3 hrs. Max. Marks: 100

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

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.

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Module-1

1 a. List the limitations of conventional microwave tubes? Discuss how these limitations can be reduced? **(06 Marks)**

b. A transmission line has following parameters :
R = 2Ω/m, G = 0.5mho/m, f = 1 GHz, L = 8nH/m, c = 0.23pF.
Calculate :
i) The characteristic impedance
ii) The propagation constant. **(06 Marks)**

c. Explain Suflex Klystron oscillator with neat block schematic and mode curves. **(08 Marks)**

OR

2 a. Derive the equation of transmission line and discuss its possible solution. **(10 Marks)**

b. List the characteristics of smith chart. **(05 Marks)**

c. A certain transmission line has a characteristics impedance of 75 + j0.01ohms and is terminated in a load impedance of 70 + j50ohms. Compute the reflection coefficient, transmission coefficient and standing wave ratio. **(05 Marks)**

Module-2

3 a. Derive the S-matrix representation for multiport network and using this derive the S-matrix solution for E–plane T Junction. **(10 Marks)**

b. Explain different types of attenuators, with its neat schematic diagram. **(10 Marks)**

OR

4 a. List the characteristics of magic – T when all the ports are terminated with matched load. Also derive the S – matrix relation along with its schematic. **(10 Marks)**

b. In a H – plane T Junction, compute power delivered to the loads of 40ohms and 60ohms connected to arms 1 and 2 when a 10MW power is delivered to the matched port 3. Choose characteristic impedance $Z_0 = 50\Omega$. **(06 Marks)**

c. Example briefly phase shifter. **(04 Marks)**

Module-3

5 a. A certain micro strip line has the following parameters : $\varepsilon_r = 5.23$, h = 7 mils, t = 2.8 mils and w = 10mils. Calculate the characteristic impedance of the line. **(04 Marks)**

b. Define the following terms related to antenna with relevant equation :
i) Directivity
ii) Field pattern
iii) Beam efficiency. **(06 Marks)**

c. Determine the directivity of the system if radiation intensity is given by $U = U_m \sin\theta \sin^2\phi$. When $0 \le \theta < \pi$ and $0 \le \phi < \pi$, using :
i) Exact method and
ii) Approximate method. **(10 Marks)**

OR

6 a. A lossless parallel strip line has a conducting strip width W. The substrate dielectric separating the two conducting strip has a relative dielectric constant ε_{rd} of 6 and a thickness d of 4mm calculate :
   i) the squired width w of the conducting strip in order to have a characteristic impedance of 50Ω.
   ii) Strip line capacitance
   iii) The strip line inductance
   iv) Phase velocity of the have in parallel strip line. **(10 Marks)**

   b. Explain radio communication link and derive its relation interms of received and transmitted power. **(06 Marks)**

   c. Compute the power received by the receiver antenna kept at a distance of 100km by transmitter radiating at 3MHz. Assume $G_T = 40$ and $G_R = 15$ and $P_T = 1000$ KW. **(04 Marks)**

Module-4

7 a. Obtain the field pattern for two point source situated symmetrically with respect to the origin. Two sources are fed with equal amplitude and equal phase signals. Assume distance between two sources = $\lambda/2$. **(10 Marks)**

   b. Derive the expression for radiation resistance of short dipole with uniform current. **(10 Marks)**

OR

8 a. Linear antenna consists of 04 isotropic sources. The distance between element is $\lambda/2$. The power is applied with equal amplitude and in phase. Also compute HPBW and FNBW. **(10 Marks)**

   b. Starting from electric and magnetic potential obtain the far field components for a short dipole. **(10 Marks)**

Module-5

9 a. Derive the radiation resistance of circular loop of any radius 'a'. **(10 Marks)**

   b. Find the length L, H – plane aperture and flare angle θ_E and θ_H of pyramidal horn for which E – plane aperture is 10λ. Horn is fed by a rectangular wave guide with TE_{10} Mode. Assume $\delta = 0.2\lambda$ in E – plane and 0.375λ in H – plane. Also find E – plane, H – plane beam width and directivity. **(10 Marks)**

OR

10 a. Briefly explain helical antenna with its helical geometry. **(06 Marks)**

   b. Explain different types of horn antenna with schematic diagram. **(08 Marks)**

   c. Explain the construction details of Yogi-uda array. **(06 Marks)**

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