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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S7 (R,S) (FT/WP/PT) Examination November 2025 (2019 Scheme)

Course Code: ECT401

Course Name: MICROWAVES AND ANTENNAS

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

PART A

Answer all questions, each carries 3 marks. Marks

1	Define radiation resistance of an antenna. Write the expressions for the radiation resistance of short dipole and half wave dipole.	(3)
2	Represent major lobe, minor lobe, HPBW, FNBW in a neat figure.	(3)
3	Describe any one feeding method for Parabolic dish antenna.	(3)
4	Write the design equations of a Horn antenna	(3)
5	Differentiate between broad side and end fire arrays.	(3)
6	What is the concept of phased arrays.	(3)
7	What are the features of a Cavity Resonator? Mention its main application.	(3)
8	What are slow wave structures? Illustrate the different types.	(3)
9	List the important properties of S matrix.	(3)
10	With neat diagram, explain the features of an H-plane Tee.	(3)

PART B

Answer any one full question from each module, each carries 14 marks.

Module I

11	a)	State and prove Helmholtz theorem.	(7)
	b)	Calculate the approximate directivity of a unidirectional antenna if the normalized power pattern is given by: (a) $P_n=\cos\theta$(b) $P_n= \cos^2\theta$.Calculate the respective gains for an efficiency of k=0.4.	(7)

OR

12	a)	Derive the value for Directivity of a short dipole.	(7)
	b)	Calculate the radiation resistance of a dipole of length $\lambda/10$.What is the radiation resistance if the length is increased by 5 times?	(7)

Module II

13 a) Describe the principle of Helical antenna. List out the features of the different modes. (8)

b) List the design equations of a rectangular Microstrip patch antenna. (6)

OR

14 a) With all necessary design equations and schematic, describe the principle of Log periodic antenna (9)

b) Calculate the required aperture area for an optimum rectangular horn antenna operating at 2 GHz with 12 dBi gain. (5)

Module III

15 a) Derive the expressions for the total field radiated by two isotropic point sources fed with currents of same amplitude and phase. Find the directions of pattern maxima and minima. (9)

b) Write the design steps of a 2M element Dolph-Chebyshev array with spacing d between elements (5)

OR

16 a) Illustrate the principle of pattern multiplication with an example. (6)

b) Derive the expression for the total field radiated by linear array of N isotropic point sources and write the expression for Array factor. (8)

Module IV

17 a) Explain the constructional details and principle of operation of Travelling Wave Tube with neat diagram. (8)

b) Derive the expression for bunching parameter of a Reflex Klystron. (6)

OR

18 a) Explain the working of an 8 cavity Cylindrical Magnetron with neat diagram. (8)

b) Derive the equation for the resonant frequency of a rectangular cavity resonator. Calculate the lowest resonant frequency of a rectangular cavity resonator of dimension a = 2cm, b = 1 cm, d = 3 cm. (6)

Module V

19 a) With a schematic, describe the principle of operation of Isolator. (7)

b) Enumerate the constructional features of a two-hole directional coupler and derive the S matrix. (7)

OR

20 a) With neat figure, describe the principle of E-plane Tee. Obtain the S matrix of E-plane Tee. (7)

b) With the help of a graph, list out the features of the four basic modes of operation of a Gunn diode. (7)

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