MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

V SEMESTER BTECH. (E & C) DEGREE END EXAM – Nov/Dec 2022 SUBJECT: MICROWAVE ENGINEERING (ECE - 3154) –SET 1

TIME: 3 HOURS

MAX. MARKS: 50

Q. No.	Questions	M *	C*	A *	B *
1.	What is mode jumping in Magnetron? Explain various method to eradicate it.	5	2	2,3,4,7,8,9,10	3
2.	A reflex klystron is oscillating at 10 GHz when operated in $2\frac{3}{4}$ mode; find the transit time of the electron in repeller space in nano seconds (ns).	3	2	2,3,4,7,8,9,10	4
3.	Explain the limitation of conventional tubes at microwave frequencies.	2	2	2,3,4,7,8,9,10	3
4.	Draw and explain the Applegate diagram of Reflex klystron	5	2	2,3,4,7,8,9,10	3
5.	Two-matched hybrid Tee are connected through two H-plane arms to form a six-port device. If 4 mW of power is fed into port 1 then find the output power in mW in other five ports namely 1', 2, 2', 4, 4'.	2	1	1,2,3,4,7,8,9,10	4
6.	Draw current pattern of half wavelength dipole for (i) t=0 (ii)t=T/8,(iii)t=T/4	3	3	4,5,7,8,9,10	3
7.	The radiation intensity of an Antenna is $\cos^4 \theta$ for the $0 \le \theta \le 90^\circ$ with $0 \le \Phi \le 360^\circ$. Find maximum effective aperture using all the formulae for f = 10 GHz.	5	3	4,5,7,8,9,10	3
8.	Explain with diagram (a) microstrip, (b) array and (c) Fractal antennas	3	5	1,5,6,7,8,9,10	3
9.	What are the challenges for modeling millimetre wave 5G antennas.	2	5	1,5,6,7,8,9,10	3
10.	Define the term (a) Polarization Loss Factor (b) Antenna efficiency	2	3	4,5,7,8,9,10	3
11.	Starting from fundaments derive the expression for radiation resistance of an infinitesimal dipole	4	4	1,5,6,7,8,9,10	3
12.	Derive the value of directivity for a small dipole	4	4	1,5,6,7,8,9,10	3
13.	Starting from fundamentals obtain the value of radiation resistance of a half wave dipole	4	4	1,5,6,7,8,9,10	3
14.	Derive vector wave equation in terms of magnetic vector potential and obtain its solution	4	3	4,5,7,8,9,10	3
15.	A resonant half wavelength dipole is made out of copper ($\sigma = 5.7 \times 10^7$ S/m) wire. Determine the conduction and dielectric (radiation) efficiency of the	2	3	4,5,7,8,9,10	3

dipole antenna at $f = 100 \text{ MHz}$ if the radius of the wire		
b is 3 x 10 ⁻⁴ λ , and the radiation resistance of the $\lambda/2$		
dipole is 73 ohms		

M*--Marks, C*--CLO, A*--AHEP LO, B* Blooms Taxonomy Level