MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

FIFTH SEMESTER BTECH. (E & C) DEGREE END SEMESTER EXAMINATION
JANUARY/FEBRAURY 2021
SUBJECT: MICROWAVE ENGINEERING (ECE - 3154)

TIME: 3 HOURS   **MAX. MARKS: 50**

Instructions to candidates
- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. The incident and reflected power in a waveguide can be sampled using a 40 dB directional coupler. The value of VSWR is 3, and the coupler sampling power value is 4 mW. Find the value of reflected power.

1B. Input cavity of a two cavity klystron is 0.1 cm wide. If the frequency of the applied RF signal is 1 GHz and beam accelerating potential is 2500 Volts, determine the number of cycle that would elapse during the transit of beam through the input gap. Assume that RF signal amplitude is negligible as compared to accelerating potential.

(5+5)

2A. A 20 mV signal is fed to the series arm of a lossless Magic Tee junction. Calculate the power delivered through each port when other ports are terminated with a matched load.

2B. Describe briefly: i. Yagi-Uda Antenna   ii. Millimeter wave characteristics

(5+5)

3A. A microstrip line is used as a feedline to a microstrip patch. The substrate of the line is alumina ($\varepsilon_r = 10$) while the dimensions of the line are width-to-height ratio w/h=1.2 and thickness-to-height ratio t/h=0. Determine the effective dielectric constant and characteristics impedance of the line.

3B. For a typical communication system employing antenna with fixed amount of radiated power and fixed amount of spacing between transmitting and receiving antennas, explain in detail five major factors which can contribute for low power delivered to the receiver.

(5+5)

4A. Derive vector wave equation & obtain also its solution for a electric current source.

4B. Starting from fundamentals obtain the value of radiation resistance of dipole whose length l = λ/20.

(5+5)

5A. Starting from fundaments, show that the Directivity of a small circular loop antenna is 1.5.

5B. Design a 3 element -40 dB side lobe level Dolph Tschebyscheff array of isotopic point sources placed symmetrically about z axis. Determine excitation coefficients, Array factor and angle of nulls for spacing between elements d = 3λ/4.

(5+5)