

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), April-May 2018

B. Tech in Electronics & Comm. Engineering, Semester - VI

Roll No.....

ECE601: MICROWAVE ENGINEERING-II

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A	Objective type multiple choice questions (10 questions @ 1 mark)	10
i.	The Doppler frequency provides the information on (a) Range of the target (b) direction of the target (c) velocity of the target (d) number of targets	
ii.	A faraday rotation isolator uses which of the following faraday rotation? (a) 45° twist, 45° rotation (b) 90° twist, 90° rotation (c) 45° twist, 90° rotation (d) 90° twist, 45° rotation	
iii.	Barraters are used for the measurement of (a) VSWR (b) Impedance (c) Power (d) Frequency	
iv.	For tracking the RADAR antenna beam pattern is (a) Omni directional (b) isotropic (c) highly directive (d) none of these	
v.	A dipole antenna is a (a) Conduction current antenna (b) displacement current antenna (c) both conduction & displacement (d) none of the above	
vi.	Manganese ferrite may be used as a (indicate the false statement) (a) circulator (b) Garnet (c) Isolator (d) Phase shifter	
vii.	Geostationary satellites are placed in equatorial orbits at a height of approximately (a) 36000 km (b) 180000 km (c) 9000 km (d) 4500 km	
viii.	In a slotted line, measurement probes are placed at half power points to measure (a) load impedance (b) high VSWR (c) guided wavelength (d) low VSWR	
ix.	Large microwave power may be measured with a (a) Calorimeter (b) barrater (c) thermistor (d) thermocouple	
x.	In a Yagi-Uda antenna, the directors show (a) Capacitive impedance (b) Inductive impedance (c) resistive impedance (d) characteristics of an LC tank circuit.	
Q.2	Short answer type questions (4 questions @ 2.5 marks)	10
i)	What is reflection coefficient? What will be its value for the case of open circuit, short circuit conditions?	
ii)	State the purpose of isolators and circulators in microwave communication.	
iii)	How you can use microwave engineering to measure the thickness of a metal and dielectric sheet.	
iv)	Why the "S" parameters are used in microwave and not the H, Y, Z or ABCD parameters.	

Q.3A	What is scattering matrix? Outline its properties.	05
Q.3B	The s- parameters of a two port network are given as follows; $[S] = \begin{bmatrix} 0.2 \angle 0^\circ & 0.6 \angle 90^\circ \\ 0.6 \angle 90^\circ & 0.1 \angle 0^\circ \end{bmatrix}$ (a) Prove that the network is reciprocal but not lossless (b) Find the return loss at port 1 when port 2 is short circuited.	05
Q.4A	What is Gyrator? State its practical application. Explain the working of 180° phase shift Gyrator with the help of a neat diagram.	05
Q.4B	What is tee junction? Explain briefly the commonly used three different types of tee junction.	05
Q.5A	State the basic principle of an antenna. Briefly explain the construction of a Yagi-Uda antenna and its properties.	05
Q.5B	Two aircrafts are flying at altitudes of 3 km & 5 km respectively. What is the maximum possible distance along the surface of the earth over which they can have effective point to point microwave communication? Assume the radius of earth = 6.37×10^6 metres.	05
Q.6A	Make a comparison among different types of power sensors such as thermoelectric sensors, diode sensors, bolometers.	05
Q.6B	Explain the procedure to measure VSWR using microwave test bench.	05
	OR	
Q.6B	Draw and explain in detail block diagram of a MTI Radar.	05
Q.7A	State the principle of satellite communication. Briefly explain the different types of satellites used.	05
Q.7B	A radio communication link is to be established via ionosphere. Take maximum virtual height to be 100 km at the mid-point of the path. Assuming critical frequency as 2×10^6 Hz and distance between stations to be 600 km, find optimum working frequency (OWF) of this communication.	05
	OR	
Q.7B	A VHF communication is to be established with 35 W transmitters at 90 MHz. Find the distance up to which the line of sight communication may be possible if the height of the transmitting and receiving antennas are 40 m and 25 m respectively. Also determine the field strength at the receiving end.	05
Q.8A	What is electromagnetic wave? Explain the different modes of propagation of electromagnetic waves.	10
Q.9A	State the basic principle of radar. Identify its application in various fields. Derive the equation for the range of radar.	10
Q.9B	State the principle of thermo couple. Draw the schematic diagram of a thermocouple power sensor and explain it in detail.	10
	OR	
Q.9B	State the principle of bolometer. Through a schematic diagram explain in detail how it is used for microwave power measurement.	10