

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018

Marks Scored:

Level : B.E.

Year : IV

Course : ETEG 408

Semester: I

Exam Roll No.:

Time : 30 mins.

F.M. : 20

Registration No:

Date FEB 26 2018

SECTION "A"

[20 Q.×1=20 marks]

Choose the most appropriate answer.

1. A satellite downlink at 12 GHz operates with a transmit power of 6 W and an antenna gain of 48.2 dB. The EIRP in dBW is _____.
a. 45 dBW b. 50 dBW c. 75 dBW d. 56 dBW
2. A 20 m antenna gives a certain uplink gain at frequencies of 4/6 GHz. For getting same gain in the 20/30 GHz band, antenna size required is _____ metre.
a. 100 b. 4 c. 1 d. 10
3. Pulse radar operating at 10 GHz frequency has an antenna with a gain of 28 dB and a transmitted power of 2 kW. If it is desired to detect a target of cross section 12 m^2 , and the minimum detectable signal is -90 dBm , the maximum range of the radar is _____.
a. 8114 m b. 2348 m c. 1256 m d. 4563 m
4. If the target cross section is changing, the best system for accurate tracking is _____.
a. lobe switching b. sequential lobing
c. conical scanning d. monopulse
5. If a return echo arrives after the allocated pulse interval, _____.
a. it will interfere with the operation of the transmitter
b. the receiver might be overloaded
c. the target will appear closer than it really is
d. it will not be received
6. MTI Radar is _____.
a. CW radar b. Pulsed radar c. FMCW radar d. CW Doppler radar
7. When the electric field in a waveguide is perpendicular to the direction of wave propagation the mode is said to be _____.
a. electrical polarization b. horizontal polarization
c. transverse electric d. transverse magnetic
8. The wavelength of a wave in a waveguide _____.
a. is greater than of free space
b. depends only on the waveguide dimensions and the free-space wavelength
c. is inversely proportional to the phase velocity
d. is directly proportional to the group velocity

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SECTION "B"

Attempt *ANY FIVE* questions. Missing data may be suitably assumed. Each symbol carries their usual meaning.

1. a. Why a certain range of frequency is known as "Microwave"? Express the standard frequency bands allocation used for microwave devices and system? [3]
b. Make a list of important applications and the corresponding characteristics of microwave systems. [4]
c. Explain the working and importance of stripline for microwave frequency? [4]
- 2.a. What is GNSS system? Compare GPS and GLONASS. [4]
b. A 1 KW, 3 GHz radar uses single antenna with a gain of 30 dB. The receiver has noise bandwidth of 1 KHz and a noise factor of 5 dB. A target of radar cross section of 10 m^2 at a range of 18520 m is to be detected. Calculate the minimum S/N. [4]
c. Explain the application and working of SAW devices. What is the significance of SAW devices in microwave communication? [3]
- 3.a. What are the applications of cavity resonator and parametric amplifier? [2]
b. With the help of a neat diagram explain the operating principles of Travelling Wave Tube. [4]
c. Explain the properties and advantage of geostationary orbit. The range between a ground station and a satellite is 42000 km. Calculate the free space loss at operating frequency of 6 GHz. [2.5+2.5]
- 4.a. A target is receding on a radial of radar with a relative velocity of 501.6 m/s. The radar transmits continuous wave energy at a wave length of 2.5 cm. what will be the Doppler shift of the target? What will the Doppler shift if the target alters its course by 45° ? [4]
b. Explain Gunn Effect. With the help of schematic diagram explain the working principle of a Gunn diode. [4]
c. Compare the Klystron and Magnetron on the basis of their,
i) Basic construction ii) Operation iii) Applications [3]
- 5.a. Explain the working mechanism and application of VOR. [5]
b. A rectangular waveguide with dimensions 2.42 cm x 1.12 cm supporting TE_{01} mode at 6 GHz is filled with a dielectric of relative permittivity ϵ_r . What are the limits on ϵ_r if only the dominant mode is propagates? [6]
- 6.a. What do you understand from Fresnel zone clearance? Why it is important for Microwave radio link design explain with example. [4]
b. A rectangular waveguide carries an electromagnetic wave having a frequency of 4000 MHz. A standing wave indicator shows that wavelength of the wave in the guide is 11.4 cm. What is the cut-off wavelength of the waveguide and the velocity at which energy is propagated along the guide? [4+3]

