KATHMANDU UNIVERSITY
End Semester Examination
December 2024/ January 2025

Level : B.E. | Course : ETEG 408
Year : IV | Semester : I
Time : 2 hrs. 30mins. | 2025 Jan-5 | F. M. : 40

SECTION "B"
[4 Q. × 10 = 40 marks]

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

1.
a. Explain in detail about microwave radio relay system and its significance in modern day's communication. [3]
b. What is GNSS? Why we need GNSS? Explain the working principle of conventional and differential GPS? [5]
c. Explain the function of a Magic Tee in a microwave system. [2]

2.
a. Explain the effect of multipath propagation for microwave system. What are the mitigation techniques explain in detail. [3+2]
b. Explain the working principle of Doppler VOR with suitable diagram. [3]
c. Explain the significance of the carrier-to-noise ratio in satellite communication. [2]

3.
a. Explain the methods for minimizing high power microwave radiation exposure. [2]
b. Discuss the role of high resolution radar for target recognition. Propose the techniques to improve the target accuracy in the presence of noise and clutter. [2+2]
c. A FMCW radar operates at a center frequency of 10 GHz with a triangular frequency sweep of 100 MHz. [2+2]
   i. If the beat frequency measured at the receiver is 50 kHz, calculate the distance to the target.
   ii. What is the maximum unambiguous range of this FMCW radar?

4.
a. Discuss the concept of SAR and its importance in safety regulations. Discuss about radiation zone and radiation limit. [1+2]
b. What are the primary causes of signal attenuation in satellite communication, and what are mitigation techniques? [4]
c. A mobile phone emits electromagnetic radiation are as follows,
   - Power density = 1.5 W/m^2 , Tissue conductivity = 0.9 S/m ,
   - Mass density of the tissue = 1,000 kg/m^3 , Electric field strength = 10 V/m

   Calculate the SAR value and compare your result with FCC standard. [3]

5.
a. Explain the working principle of a TWT. Discuss the differences between a TWT and a Klystron amplifier in terms of bandwidth and efficiency. [3+2]
b. Define a stripline and explain how it is used in microwave circuits. Discuss its advantages over microstrip lines in terms of signal integrity and electromagnetic interference. [5]