(1) الغرفة الرابعة ٢٠١٩

MENOUFIA UNIVERSITY
FACULTY OF ELECTRONIC ENGINEERING.
SUBJECT: Satellite Engineering.
Dept. of Electronic & Electrical Communication.
4th year final Exam. May 2019 TIME: 3 Hrs.

ANSWER THE FOLLOWING QUESTIONS: (60 Mark)

Question 1

A: 1 – State the different types of satellite transmission losses.
2 – State the main causes of perturbations of satellite orbits.
3 – State the different types of intersatellite links.
4 – State the different services provided by the satellite.

B- A satellite at a distance of 40000 Km from a point on the earth's surface radiates a power of 2 W from an antenna with a gain of 17 dB in the direction of the observer. **Find:**
1 – The flux density at the receiving point.
2 – The power received by an antenna with an effective area of 10 m^2.

Question 2

A – Derive the mathematical expression of the satellite velocity and orbital period for the elliptical orbit.

B – Consider a satellite that travels in a circular orbit for which the period is 1-day. **Calculate the following:**
1 - The radius for the orbit.
2 - The orbital velocity in Km/hr.
3 - The satellite orbital period at that altitude.
4 - The satellite altitude in Km.

Question 3

A – Draw the general block diagram of satellite wideband receiver.

B – Draw the general block diagram of FH-CDMA transmitter and

C – Discuss briefly with mathematical analysis and drawing the principles of spread spectrum multiple access.

Question 4

Discuss briefly the following:

1 – Handover in LEO satellite network.
2 – Telemetry, Tracking and Command (TTC) system.
3 – The Intermodulation Product (IM) and how to reduce it.
4 – Satellite transponder channels in C – band.
5 – Prove that the satellite footprint for MEO orbit is greater than the footprint for LEO orbit.

Question 5

A – **Compare between the following:**
DS - CDMA, FH - CDMA and the TH - CDMA.

B – Design a TDMA system for multiplexing 4 signals. Three of these signals are band limited to 4 kHz, while the fourth one is band limited to 12 kHz.
1 - Sketch the block diagram of the TDMA system.
2 - Draw the TDMA frame structure.
3 - Determine the transmission rate of the channel if PAM is used.
4 - For a PCM of 1024 levels, determines the bit rate and bandwidth required.

Question 6

A – Compare using the mathematical equations and with drawing between the capacities of pure Aloha, the capacity of Slotted Aloha and the capacity of Aloha with capture showing the conditions and the values of maximum capacities in each case.

B – Consider a satellite channel with a rate of 50 Mb/s. If slotted Aloha with capture is adopted with probability of 0.333 for three collided packets. How many users can be supported if the user traffic = 3 kb/s.