Communications and Information Engineering Program
Wireless Sensor Networks and IoT (CIE 510)
Problem Set - WSN MAC Protocols

Question 1

Explain the differences between the following classes of MAC protocols:

1) Fixed Assignment
2) Demand Assignment
3) Random Access

Question 2

Slotted-ALOHA is used in a system where packet transmissions are Poisson distributed with mean arrival rate of λ packets per second, and τ is the packet duration in seconds.
Find the highest achievable normalized throughput in such system.

Question 3

A multiple access system with an available bandwidth of 10 MHz is required to support a number of sensor nodes, each transmits data with a bit rate of 10 kbps. Find the maximum number of sensors that the following systems can support:

1) FDMA system with guard-band of 5% of the sensor's signal bandwidth.
2) TDMA system with identification bits per slot equal to 3% of sensor data bits, and the synchronization bits per frame are equal to 200% of sensor data bits.

Question 4

Explain, using supporting graphs, the hidden terminal problem and the exposed terminal problem in wireless MAC.

Question 5

Explain why and how the busy-tone solutions and the RTS/CTS handshake are used in WSN.