WIRELESS AD HOC AND SENSOR NETWORKS
(ECEN 5131)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

  (i)   AODV protocol is based on
     (a) DSDV   (b) DSR   (c) MACAW   (d) none of these.

  (ii)   In DSDV protocol, the final route is determined by
     (a) the number of hops   (b) the next node
     (c) the destination   (d) the sequence no.

  (iii)   Which of the following is the first command in a handshake protocol?
     (a) CTS   (b) RTS   (c) ACK   (d) None of these.

  (iv)   Sources are said to be of primary type if they have the following:
     (a) high TX power   (b) more than one channel
     (c) allocated fixed BW   (d) all of these.

  (v)   Mobile stations do not sense the medium during
     (a) SIFS   (b) RTS   (c) NPV   (d) CTS.

  (vi)   Sources are said to be of primary type if they have the following:
     (a) high TX power   (b) more than one channel
     (c) allocated fixed BW   (d) all of these.

  (vii)   Which one is a passive attack in MANETS?
     (a) Blackhole   (b) Wormhole
     (c) Jamming   (d) Snooping.

  (viii)   Flooding has the following disadvantages:
     (a) Overlap   (b) Implosion
     (c) Resource blindness   (d) All of these.

  (ix)   In DSDV routing table, the 'sequence number' = ∞ indicates:
     (a) an updated sequence   (b) the old sequence
     (c) a new node   (d) the route is broken.

  (x)   Sensor networks are
     (a) address centric   (b) data centric
     (c) location centric   (d) none of these.

Group – B

2. (a)   Differentiate between exposed and hidden terminals in Ad Hoc networks. Show how hidden terminals create serious interference problem.

   (b)   How does MACAW protocol improve the synchronization with respect to MACA protocol? Explain clearly. How does packet transfer take place using MACA protocol? Explain with a suitable diagram.
                   (2 + 2) + (4 + 4) = 12

3. (a)   Why does DSR protocol not require beacon? Show how a route is established using DSR protocol for an Ad Hoc wireless network consisting of 10 nodes with necessary explanations.

   (b)   What is the function of 'Route Reply' packets in DSR? Explain clearly.
                   (3 + 6) + 3 = 12

Group – C

4. (a)   What is 'desensitization' of a radio receiver? In which stage does it occur? Show mathematically how this phenomenon may occur in a micro-controller based radio receiver.

   (b)   In a multi-channel radio receiver, the SINAD for channel 1 is 18 dB at the given RF input signal strength. For the same RF input, the SINAD for channel 2 is 6 dB. Assuming that the degradation of SINAD is only due to platform noise of the radio, design a circuit so that the interference is eliminated for channel 2. Explain the operation of the circuit.
                   (2 + 4) + 6 = 12

5. (a)   How does packet transfer take place using the MAC protocol MACA-BI? Explain with a suitable diagram. Elucidate the differences between MACA and MARCH protocols with the help of handshake mechanism diagrams. Hence, show that MARCH takes less time to execute.

   (b)   Define the RAS approach for power saving in nodes. Show the schematic diagram for a circuit using RAS solution.
                   7 + 5 = 12

Group – D

6. (a) What is meant by holes in RF spectrum? Express mathematically (i) spectrum utilization and (ii) spectrum utilization efficiency. Hence, find out the relationship between the two.

   (b) What are the techniques applied to improve spectrum utilization? Explain how Hot Spots help to reduce RF congestion. Explain how Cognitive radios help to improve spectrum efficiency.

   6 + (2 + 2 + 2) = 12

7. (a) Define primary and secondary radio units. What is the importance of localization of primary units by the secondary units in underlay networks? Give an idea as to how the process of localization can be implemented.

   (b) What are the main challenges in providing security in Ad Hoc wireless networks? Describe at least four. Explain Denial-of-service attack and Jamming attack in Ad Hoc wireless networks.

   (2 + 4) + (3 + 3) = 12

Group – E

8. (a) What are the differences between ad hoc and sensor wireless networks? Give some typical examples of sensor networks. Explain the importance of distributed processing and battery conservation for a well-designed sensor network.

   (b) Explain the importance of clustered architecture for sensor networks. What is LEACH? How is the cluster-head selected?

   6 + 6 = 12

9. (a) What are the differences between flooding and gossiping? What is rumor routing?

   (b) What is PEGASIS? Describe the goals and explain this chain.

   (4 + 3) + 5 = 12