

**AD HOC WIRELESS NETWORKS  
(ECEN 4127)**

**Time Allotted : 3 hrs**

**Full Marks : 70**

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one 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) Which multiple access technique is used by IEEE 802.11 standard for wireless LAN?  
(a) CDMA                      (b) CSMA/CA                      (c) ALOHA                      (d) CSMA/CD.
  - (ii) In AODV routing algorithm for MANETs, the route is discovered at time  
(a) only when the network is established  
(b) in middle of the transmission  
(c) when there is a need for route by the host  
(d) when there is no need for route by the host.
  - (iii) The two sub layers of data link layers are  
(a) LLC and MAC    (b) LLC and Transport  
(c) Physical and MAC    (d) MAC and Session.
  - (iv) The hidden and exposed terminal problems significantly reduce  
(a) Mobility    (b) Security  
(c) Throughput    (d) All of the above.
  - (v) In AODV routing algorithm for MANETs, the route is discovered at time  
(a) only when the network is established  
(b) in middle of the transmission  
(c) when there is a need for route by the host  
(d) when there is no need for route by the host.
  - (vi) The busy tone multiple access protocol is proposed for overcoming  
(a) Exposed terminal problem    (b) Hidden terminal problem  
(c) Mobility problem    (d) Scalability problem.
  - (vii) Major advantages of hybrid wireless network:  
(a) Higher capacity than cellular networks  
(b) Increased flexibility and reliability in routing.  
(c) Both (a) and (b)  
(d) None of the above.

- (viii) Dynamic source routing protocol (DSR) is an  
(a) Table driven protocol (b) On-demand routing protocol  
(c) Hybrid routing protocol (d) Hierarchical routing protocols.
- (ix) Control packet used by MACA  
(a) RTS packet (b) CTS packet  
(c) Both (a) and (b) (d) None of the above.
- (x) Route computation and maintenance must involve  
(a) Minimum Number of nodes (b) Maximum number of nodes  
(c) Moderate number of nodes (d) None of the above.

**Group - B**

2. (a) How does the Ad Hoc Wireless Network differ from cellular network?  
[CO1,CO2]Analyze/IOCQ
- (b) "The design of the wireless sensor network is a challenging task due to various constraints" - Explain the statement with proper justification.  
[CO1,CO2]Apply/IQCQ
- (c) Explain why the following issues need to be considered while designing an adhoc wireless system (i) Scalability (ii) Self organization.  
[CO1,CO2]Evaluate/HQCQ  
**4 + 4 + 4 = 12**
3. (a) Outline how node scheduling is done in contention-based MAC protocols with scheduling mechanism.  
[CO2,CO4][Analyze/IOCQ]
- (b) How MACA protocol with piggy-backed reservation works? Discuss with an example.  
[CO2,CO4,CO6][Evaluate/HQCQ]
- (c) What are the advantages of the BTMA protocol? How are they overcome in the DBTMA protocol?  
[(CO2,CO4,CO6)Remember/LOCQ,Analyze/IOCQ]  
**4 + 4 + (2 + 2) = 12**

**Group - C**

4. (a) What are the factors on which the design of routing protocol for ad hoc wireless networks depends?  
[CO1,CO3]Analyze/IOCQ
- (b) Write down the difference between Proactive routing and Reactive routing.  
[CO1,CO3][Remember/LOCQ]
- (c) Explain the AODV Routing protocols with neat diagram. [CO3,CO6][Analyze/IOCQ]  
**4 + 4 + 4 = 12**
5. (a) What do you mean by loop free property of a routing protocol? Which protocol is suitable for such scenario?  
[CO3][Analyze/IOCQ]
- (b) Describe Hierarchical routing protocol with multiple labels.  
[CO3,CO6][Analyze/IOCQ]
- (c) Evaluate the link reversal property of TORA?  
[CO3][Evaluate/HQCQ]  
**4 + 4 + 4 = 12**

**Group - D**

6. (a) Why does TCP not perform well in Ad Hoc wireless networks?  
[CO1,CO6][Analyze/IOCQ]
- (b) Sketch the classification tree of transport layer protocol.  
[CO2,CO6][Remember/LOCQ]
- (c) List the issues in designing a transport layer protocol for ad hoc wireless networks.  
[CO2,CO6][Analyze/IOCQ]  
**5 + 3 + 4 = 12**
7. (a) “Feedback based TCP(TCP-F) is a modification of traditional TCP to improve the performance in adhoc scenario” – Justify the statement with a suitable diagram.  
[CO2,CO6][Analyze/IOCQ]
- (b) Draw and explain the state diagram for adhoc TCP or A-TCP.  
[CO2,CO6][Evaluate/HOCQ]
- (c) How Split TCP solves the issue of congestion control and end to end reliability.  
[CO2,CO6][Analyze/IOCQ]  
**4 + 4 + 4 = 12**

**Group - E**

8. (a) How mobility of nodes affect the QoS and throughput in Adhoc wireless networks?  
[CO2,CO5][Analyze/IOCQ]
- (b) Write down the difference between hard state versus soft state resource reservation.  
[CO2,CO5][Understand/LOCQ]
- (c) Discuss Power-aware multi-access signalling with state diagram.  
[CO2, CO5][Evaluate/HOCQ]  
**4 + 4 + 4 = 12**
9. Write short notes on any three of the following: **(4 × 3) = 12**
- (i) The hidden and exposed problems in MAC Layer
- (ii) MACAW protocol
- (iii) Hybrid routing protocol
- (iv) DCF and PCF. [CO2,CO3,CO4,CO5][Understand/LOCQ]

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| Cognition Level         | LOCQ  | IOCQ  | HOCQ |
|-------------------------|-------|-------|------|
| Percentage distribution | 19.79 | 55.21 | 25   |

**Course Outcome (CO):**

After completing the course the student will be able to:

1. Understand the underlying technologies of wireless communication networks.
2. Analyze the various design issues and challenges of Ad hoc Networks.
3. Different routing protocols and their operations will be clear to them.
4. Learn about the contention in MAC layer and ways to solve them.
5. Students will be familiar with the network design strategies to assure adequate QoS.
6. Apply their knowledge to develop new and improved applications.

\*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question;  
HOCQ: Higher Order Cognitive Question