AD HOC NETWORKS AND SECURITY
(ECEN 4144)

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) Nodes must be scheduled in a distributed fashion for gaining access to the channel because
(a) there is no centralized coordinators
(b) nodes are not communicating with each other
(c) exposed terminal problem
(d) power level of the receiving data is very weak.

(ii) Multichannel Protocols are example for
(a) Contention Based Protocol
(b) Contention Based Protocol with Reservation Mechanism
(c) Contention Based Protocol with Scheduling Mechanism
(d) Other MAC protocol.

(iii) Issues with design of MAC Protocol for Ad Hoc wireless network involve
(a) Bandwidth efficiency (b) Quality of Service
(c) Synchronization (d) All of the above.

(iv) The layer that preventing signal jamming denial-of-service attacks?
(a) Physical Layer (b) Network Layer
(c) Link Layer (d) Application Layer.

(v) Path between member nodes in two separate clusters with CGSR protocol involve
(a) cluster heads and common cluster gateway (b) cluster heads
(c) common cluster gateway nodes (d) cluster member nodes.

(vi) The MAC wireless protocol which is not categorized under Contention Based Protocols is
(a) MACAW (Multiple Access with Collision Avoidance for Wireless)
(b) BTMA (Busy Tone Multiple Access)
(c) CATA (Collision Avoidance with Time Allocation)
(d) MARCH (Media Access with Reduced Handshake).

(vii) The TCP does not perform well in Ad Hoc wireless networks due to
(a) misinterpretation of packet loss (b) frequent path breaks
(c) asymmetric link behaviour (d) all of the above.

(viii) IEEE802.11 defines the basic service set as the building block of a wireless
(a) LAN (b) WAN protocol
(c) MAN (d) All of the above.

(ix) Ad hoc based on _____ protocols.
(a) novel auto discovery (b) single-hop routing
(c) http (d) multi-hop routing

(x) Which of these is a benefit of an Ad Hoc Network?
(a) Very high speeds
(b) They are very organised
(c) It's a flexible network
(d) They are less secure so more people can access them.

Group- B

2. (a) What are the design goals of a MAC protocol for Ad Hoc wireless network? [(CO4)(Remember/LOCQ)]
(b) State the hidden and exposed terminal problem. [(CO1, CO2)(Analyze/IOCQ)]
(c) How is synchronization achieved between nodes in Collision Avoidance Time Allocation (CATA) protocol? [(CO2)(Analyse/LOCQ)]

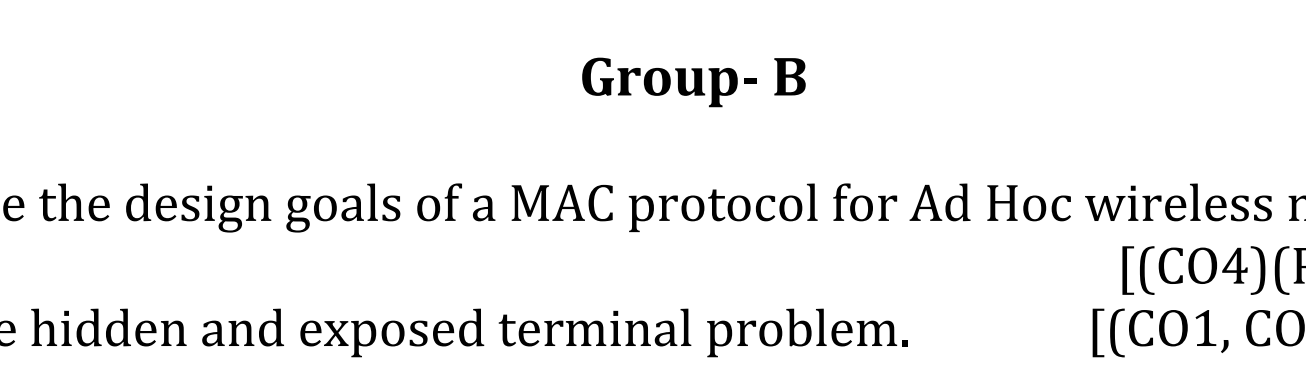
5 + 4 + 3 = 12

3. (a) Design and explain MACA Protocol with suitable diagram. [(CO2)(Design/HOCQ)]
(b) Explain the design goals of a MAC Protocol for Ad Hoc Wireless Networks. [(CO2)(Design/HOCQ)]

(6 + 2) + 4 = 12

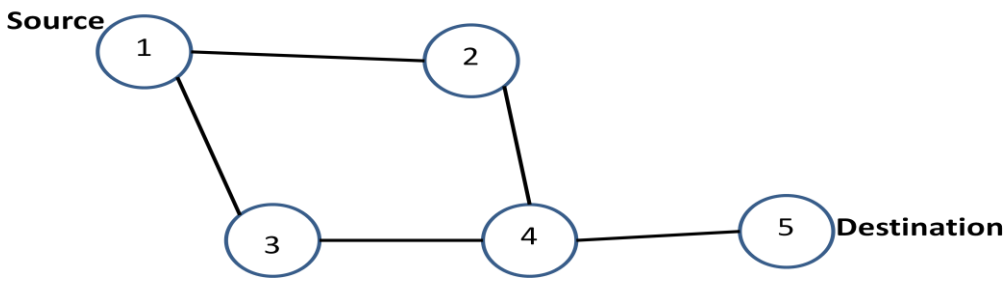
Group - C

4. (a)



In the above AdHoc wireless communication network using Wireless Routing Protocol (WRP), with Node 1 as source and Node 7 as destination, find the table of routing entry at each node for the destination Node 7 showing the (i) Node id, (ii) Successor node id, (iii) Predecessor node, and (iv) and the Cost involved as each table row entry.
With node re-arrangement, if the communication link between Nodes 6 and 7 breaks then show the modified table. [(CO2) (Analyze/IOCQ)]

(b)



Using the above AdHoc wireless communication network explain the route establishment between Source Node 1 and Destination Node 5 with Dynamic Source Routing (DSR) protocol using RREQ (route requests) packet and RREP (route reply) packet paths. [(CO3)(Remember/LOCQ)]

6 + 2 + 4 = 12

5. (a) What are the issues and challenges in providing QOS in Ad Hoc Wireless Networks? [(CO5)(Analyse/IOCQ)]
   (b) Explain Hybrid Coordination function. [(CO3)(Analyse/IOCQ)]
   (c) What is Ticket _Based QoS Routing Protocol? [(CO3)(Remember/LOCQ)]

4 + 4 + 4 = 12

Group – D

6. (a) Analyze the design issues of Transport Layer Protocol (TCP) for Ad Hoc wireless networks. [(CO2, CO5)(Evaluate/HOCQ)]
   (b) What is the impact of the path length on TCP throughput? [(CO4, CO5)(Analyze/IOCQ)]
   (c) How feedback based TCP improves network performance? [(CO5)(Apply/LOCQ)]

5 + 3 + 4 = 12

7. (a) What are the issues in designing a transport layer protocol for Ad Hoc Wireless NetWorks? [(CO2)(Design/HOCQ)]
   (b) Why does TCP not perform well in Ad Hoc Wireless Networks? [(CO2)(Analyse/IOCQ)]
   (c) What are the advantage and disadvantage of TCP? [(CO3)(Analyse/IOCQ)]

4 + 4 + 4 = 12

Group – E

8. (a) What are the network security requirements that an Ad Hoc wireless networks protocol should satisfy to avoid network security attacks? [(CO1, CO6)(Evaluate/LOCQ)]
   (b) What are the types of wireless Network security threats? Name two types of attacks, with brief explanation. [(CO1, CO5)(Analyze/IOCQ)]
   (b) Battery power management is necessary for efficient network operation. Justify. [(CO1, CO6)(Evaluate/HOCQ)]

4 + 4 + 4 = 12

9. (a) Explain transmission power management schemes . [(CO5)(Analyse/IOCQ)]
   (b) What is Data Link Layer Solutions? [(CO6)(Remember/LOCQ)]
   (c) Analyse and Explain Battery Aware MAC Protocol. [(CO6)(Remember/IOCQ)]

4 + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	29.2	44.8	26

Course Outcome (CO):

After the completion of the course students will be able to
CO1. Understand the under lying technologies of wireless networks.
CO2. Analyze the various design issues and challenges of Ad hoc (wireless) Networks.
CO3. Learn different routing protocols and their working.
CO4. Learn and analyze end to end transmission schemes.
CO5. Understand network design strategies and QoS.
CO6. Our students will be able to take up research work in communication domain.

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