

AD-HOC NETWORKS AND SECURITY
(ECEN 4144)

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

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

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) Which is not a contention based receiver initiated MAC protocol for Ad-hoc network?
(a) RI-BTMA (b) MARCH
(c) MACA-BI (d) DBTMA
- (ii) Fading refers to the _____ in signal strength when received at the receiver.
(a) noise (b) fluctuations
(c) amplification (d) modulation
- (iii) In _____, when a bit stream is transmitted, a binary 1 is represented by the presence of the carrier signal $c(t)$ for a specified interval of time, and a binary 0 is represented by the absence of the carrier signal for the same interval of time.
(a) Frequency shift keying (FSK) (b) phase shift keying (PSK)
(c) amplitude shift keying (ASK) (d) Gaussian FSK (GFSK)
- (iv) Which is not an ideal characteristic for ideal routing protocol for Ad hoc wireless
(a) Distributed routing must be allowed
(b) Adaptive to frequent topology changes
(c) Route computation and maintenance should be localized with minimum nodes
(d) Network should allow loops
- (v) The CGSR
(a) is a Table driven protocol (b) has a hierarchical routing scheme
(c) uses Gateways for communication (d) uses all of above
- (vi) In table-driven routing protocols, every node maintains the
(a) Neighboring node information (b) All node information
(c) Network topology information (d) None of the above
- (vii) Routing attack is
(a) Packet replication (b) Session hijacking
(c) Wormhole attack (d) all of the above

- (viii) The collision avoidance time allocation protocol (CATA) is based on
 - (a) Dynamic topology dependent transmission scheduling.
 - (b) Static topology dependent transmission scheduling.
 - (c) Both A and B.
 - (d) None of the above.
- (ix) In ad hoc wireless networks the QoS requirements are more influenced by
 - (a) User specification
 - (b) Routing Protocols
 - (c) Topology of the network
 - (d) Resource constraints of the nodes
- (x) Which of the following is not a resource constraint of the nodes
 - (a) Battery charge
 - (b) Processing power
 - (c) Cost
 - (d) Memory

Fill in the blanks with the correct word

- (xi) To alleviate the hidden terminal problem the _____ mechanism has been devised.
- (xii) CGSR organizes nodes into clusters, with coordination among the members of each cluster entrusted to a special _____
- (xiii) Protocols belonging to Geographical information assisted routing improve the performance of routing and _____
- (xiv) Since Ad-hoc network is already have a limited resources and processing power, to keep a confidentiality w.r.t. connectivity between two nodes which are in range of each other, it uses a simple secure protocol like _____
- (xv) The network-layer security is concerned with securely delivering packets between mobile nodes through _____

Group - B

2. (a) What are propagation mechanisms by which a wireless transmitter signal can reach a receptor in its boundary region? Explain with diagram and reason. [[CO3](Analyse/HOCQ)]
 - (b) Name three main Ad-hoc wireless transmission path impediments, along with their characteristics? [[CO4](Remember/LOCQ)]
 - (c) What is the maximum data rate that can be supported on a 10Mhz noise less channel if the channel uses 8-level digital signals? [[CO2](Apply/IOCQ)]
4 + 4 + 4 = 12
3. (a) What is fading? Briefly explain fast and slow fading? [[CO3](Analyse/HOCQ)]
 - (b) Calculate the maximum achievable data rate over a 9 KHz channel whose SNR is 20db.? [[CO2](Remember/LOCQ)]
 - (c) A mobile transmitter emits a continuous radio signal at a frequency of 900 MHz. A receiver mounted on a drone is flying directly toward the transmitter. Simultaneously, the transmitter is mounted on a vehicle moving toward the drone. The drone moves at a speed of 30 m/s, and the vehicle moves at 20 m/s. Assume both are moving along the same straight line and the medium is air

(speed of electromagnetic waves $\approx 3 \times 10^8$ m/s) find the doppler shift in signal between transmitter and receiver using the relative velocity. *[[CO2)(Apply/IOCQ]]*

4 + 4 + 4 = 12

Group - C

4. (a) Name four ideal characteristics of an ideal routing protocol for ad-hoc wireless network. *[[CO3)(Analyse/HOCQ]]*
- (b) Describe the three major categories of routing protocols based on their routing information update mechanism with examples. *[[CO4)(Remember/LOCQ]]*
- (c) Is temporal information for routing for ad-hoc wireless network important? If yes then why? *[[CO2)(Apply/IOCQ]]*
- 4 + 4 + 4 = 12**
5. (a) Compare the role of centralized control in traditional and distributed databases. *[[CO3)(Analyse/HOCQ]]*
- (b) What are the parameters that characterize the basic functions of a computer network? *[[CO4)(Remember/LOCQ]][[CO2)(Apply/IOCQ]]*
- (c) Describe briefly the functions of the Transport layer of the ISO/OSI reference architecture. *[[CO2)(Apply/IOCQ]]*
- 4 + 4 + 4 = 12**

Group - D

6. (a) What are design goals of a TCP layer protocol for Ad-hoc wireless network. *[[CO3)(Comprehend/HOCQ]]*
- (b) What are effect of Network partition and remerging in TCP layer of Ad-hoc wireless network. *[[CO4)(Remember/LOCQ]]*
- (c) Describe what is a worm hole attack. *[[CO2)(Apply/IOCQ]]*
- 4 + 4 + 4 = 12**
7. (a) Why does TCP not perform well in Ad Hoc wireless networks, explain briefly with four reasons. *[[CO3)(Comprehend/HOCQ]]*
- (b) Find out the probability of a path break for an eight-hop path, given that the probability of a link break is 0.2. *[[CO4)(Remember/LOCQ]]*
- (c) Discuss the effects of multiple breaks on a single path at the TCP-F sender. *[[CO2)(Apply/IOCQ]]*
- 4 + 4 + 4 = 12**

Group - E

8. (a) List four major need for energy management in Ad-hoc wireless network. *[[CO3)(Analyse/HOCQ]]*
- (b) What are the main factors considered while designing a battery technology? *[[CO4)(Remember/LOCQ]]*
- (c) Describe the three main voltages that characterize a battery cell. *[[CO2)(Apply/IOCQ]]*
- 4 + 4 + 4 = 12**

9. (a) List the possible solutions to mitigate the denial-of-service attacks in sensor networks and explain how it improves the performance of the system. *[(CO5)(Remember/LOCQ)]*
- (b) List the types of transport layer attacks and explain about its impacts on security provisioning. *[(CO5)(Remember/LOCQ)]*

6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	41.66	29.16	29.16