1. Select the functions of the Data Link Layer: (2)
    a. Checked transmission of frames
    b. Time synchronization, coding and modulation
    c. Connection setup, routing and resource management
    d. Frame synchronization, error checking and flow control

Answer: a, d

2. Select the difference of VANET from MANET: (1)
    a. High relative speed of vehicles implies short link life
    b. Weaker wireless communication because of vehicular networks
    c. Attribute based addressing scheme
    d. None of the above

Answer: a

3. Which of the following is not an example of adhoc networks? (1)
    a. A wireless communication infrastructure among the sensors deployed in surveillance
    b. An alternate communication infrastructure for nodes of a community, without the spectrum reuse contents and the requirements of network planning of cellular networks
    c. A collection of wireless mobile hosts used by military forming a temporary network without the aid of an infrastructure or centralized administration
    d. None of the above

Answer: d

4. Select the operating characteristics of DSRC: (1)
    a. IEEE 802.11 protocol
    b. Maximum range: 1000 m
    c. Vehicle speed upto 100 mph
    d. All of the above

Answer: d

5. *set_val(rp) DSDV;*
set_val(X) 500;
set_val(Y) 400;
The above ns2 script does the following actions:
    a. Sets the routing protocol to DSDV and road dimensions to (500, 400)
    b. Sets the routing protocol to DSDV and road dimensions to (400, 500)
    c. Sets the routing protocol to DSDV and topography dimensions to (500, 400)
    d. Sets the routing protocol to DSDV and topography dimensions to (400, 500)

Answer: c

6. AODV does not allow to handle _____ links (1)
    a. unidirectional
    b. bidirectional

Answer: a

7. For the DSDV algorithm, if a node detects that a route to destination is broken: (2)
    a. then it's hop number is set to zero
    b. then it's hop number is set to infinity
    c. its sequence number is assigned an even number
    d. its sequence number is assigned an odd number

Answer : b, d

8. What is bordercasting in IERP? (1)
    a. Searching within the borders of the zone of the source node
    b. Searching within the borders of the zone of the destination node
    c. Directing the query message only to the non-peripheral nodes and repeating until the destination is found.
    d. Directing the query message only to the peripheral nodes and repeating until the destination is found.

Answer: d

9. Difference of Opportunistic Routing (OR) from AODV is: (1)
    a. broadcast of messages does not take place
    b. subset of neighbours is selected for forwarding
    c. no neighbours are selected for forwarding
    d. None of the above

Answer: b

10. Geographic Routing has been identified as a more promising routing paradigm than topology-based routing because: (2)
    a. vehicles can move only in two directions on a road
    b. performance is found to be better in urban and highway traffic scenarios
    c. it is a hybrid routing protocol
    d. All of the above

Answer: a, b

11. Which of the following is not an intra-vehicle interaction model of IoV? (1)
    a. Vehicle-to-Driver (V2D)
    b. Device-to-Device (D2D)
    c. Vehicle-to-Sensor (V2S)
    d. Vehicle-to-Pedestrian (V2P)

Answer: d *(One Mark awarded to everyone due to the lack of clarity in the question)

12. What is network security? (1)

a. consistency, message integrity, authentication, access and availability
b. consistency, message integrity, authentication, non-repudiation
c. confidentiality, message integrity, authentication, non-repudiation
d. confidentiality, message integrity, authentication, access and availability

13. In the Random Waypoint Mobility model, which of the following is true? (2)
a. a node chooses a random destination anywhere in the network field.
b. a node follows some leader's mobility with some deviation.
c. a node follows the driving rules while moving through dense streets.
d. a node change its speed at every timeslot

Answer: a

14. Algorithm CandidateSelection(s, d, ncand):

```
1  G_tmp ← temporal copy of the network topology
2  cost(s) ← ETX(s, d) in G_tmp
3  C_{s,d} ← ∅
4  while |C_{s,d}| < ncand & (s, d) connected in G_tmp do
5      cand ← first node after s in the SPF(s, d) in G_tmp
6      if cand == d then
7          C_{s,d} ← C_{s,d} ∪ {d}
8          cost(cand) ← 0
9      else
10         cost(cand) ← ETX(cand, d) in G_tmp
11         if cost(cand) < cost(s) then
12             C_{s,d} ← C_{s,d} ∪ {cand}
13         end
14     end
15     G_tmp ← delete edge(s, cand) in G_tmp
16 end
17 C_{s,d} ← C_{s,d} ordered by cost
```

Here is a candidate selection algorithm for OR. Write down in brief the steps of this algorithm in your own words. (Plagiarised answers will receive zero marks.) (5)

Answer:

Algorithm runs for a start node (s) to destination node (d) and limits the result to the size of ncand.

1. A temporal copy of the network topology is stored in G_{tmp}.
2. cost(s) is calculated as the ETX value of s to d in G_{tmp}.
3. An empty result candidate set $C_{s, d}$ is initialized.
4. Loop starts. Loop termination condition is that if $C_{s, d}$ contains the required number of candidates (ncand) and there exists a path between s and d.

5. Select cand as the first node in the path returned by the function SPF(s, d) on G_{tmp} which probably finds the shortest path from s to d.
6. The cost of cand is ETX value from cand to d or 0 if cand itself is the destination. If this cost is less than that of s, then add to the result set $C_{s, d}$.
7. Delete the edge connecting s and cand.
8. Loop ends
9. Return the set $C_{s, d}$ sorted on the ETX values of the candidates.

Note: For an exact explanation, refer to the ExOR algorithm of this paper.