

- (vi) In wireless LAN, there are many hidden stations so we cannot detect the
  - (a) frames
  - (b) collision
  - (c) signal
  - (d) data.
- (vii) Which one of the following protocol is equivalent to User Datagram Protocol in the Wireless Application Environment?
  - (a) WSP
  - (b) WTLS
  - (c) WDP
  - (d) WTP.
- (viii) While handoffs, the termination of call may be avoided by
  - (a) providing guard channel
  - (b) queuing of handoffs
  - (c) both (a) and (b)
  - (d) none of the above.
- (ix) In a fixed channel assignment strategy
  - (a) each cell is assigned a predetermined set of frequencies
  - (b) the call is served by unused channels of the cell
  - (c) the call gets blocked if all the channels of the cell are occupied
  - (d) all of the above.
- (x) A \_\_\_\_\_ is self-created when roaming wireless devices are connected over a wireless link.
  - (a) MANET
  - (b) WPAN
  - (c) DARPA
  - (d) NTDR.

**Group - B**

- 2. (a) A cellular network consists of five cells arranged as the vertices of a regular pentagon. They are numbered from 1 to 5. A channel exists between node i and j iff  $|i - j| \bmod 5 < 2$ . That means Vertex 1 is connected to vertices 2 and 5 (and so on). Each cell can have two channels allocated to them. There can be no co-channel interference for 3 and above and the same for the adjacent channels is 2.

Design a suitable channel allocation strategy for the above configuration. More credits will be given for more optimized list (of channels).

- (b) Prove that
  - (i)  $d = \sqrt{3}R$  (d and R are as shown in figure 1).
  - (ii) Express area of a hexagonal cell in terms of R. Please assume same prerequisites as in case of any cellular networks.

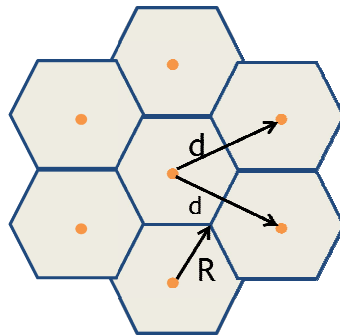


Fig.1

- (b) Compare and contrast the Link State Routing Algorithm to Distance Vector routing algorithm.

8 + 4 = 12

**Group - E**

- 8. (a) Below is an Android code snippet. Most of the detailed code is omitted to preserve space. Please pay attention to the lines numbered 1 through 6. In each case mention what is being performed (briefly, in a sentence or two).

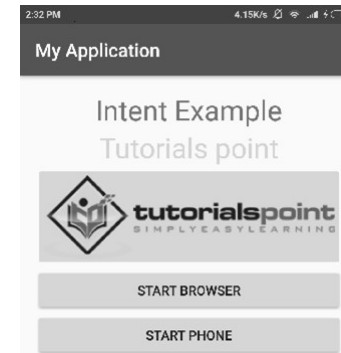
```

1: public class MainActivity extends Activity {
    String msg = "Android : ";
    @Override
2:     public void onCreate(Bundle savedInstanceState) {
3:         setContentView(R.layout.activity_main);
        @Override
4:     protected void onStart() { }
        @Override
5:     protected void onResume() { }
        @Override
6:     protected void onStop() { }
    }
    
```

- (b) What is an Android Service? With a Java Code snippet show how you can create a Service. In particular highlight the base class and various important callback methods.
- (c) In case of WAE, what is the difference in the roles played by WSP (Wireless Session) and WTP (Wireless Transaction)?

(6 × 1) + 3 + 3 = 12

- 9. (a) What is the role played by an Android Content Provider? Show with a diagram how it interacts with Apps and Internet / databases.
- (b) (i) Why is "Intent" useful in Android?



(ii) Write Java code to display the above Android screen. When the user presses "Start Browser", a corresponding webpage [www.abc.com](http://www.abc.com) will open. Show the Intent related code in particular. Also show the Manifest and other relevant files.

Only specify the relevant portion which need to be modified in each case.

(c) Mention two reasons why HTTP and HTML are not suitable for WWW access from Mobile devices. Mention two support systems in place for mobile WWW.

**(1 + 3) + (1 + 3) + (2 + 2) = 12**

**MOBILE COMPUTING  
(CSEN 4246)**

**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) A certain routing protocol uses Distance Vector protocol to create a routing table per node for each destination. It however only exchanges routing table information with its neighbours when there is some demand for route exists. Which kind of routing protocol is this?  
 (a) Hybrid (b) Proactive  
 (c) Reactive (d) Zonal.
- (ii) How many slaves can be connected to the master using SCO links in Bluetooth?  
 (a) 3 (b) 4 (c) 5 (d) 7.
- (iii) Which of the following is true regarding capacity enhancement of cellular networks?  
 (a) Cell splitting increases transmission power requirement  
 (b) Directional antennas are employed in cell sectoring  
 (c) In Microcell zone concept, handoff means a new channel reassignment to an ongoing call when different zones are traversed  
 (d) Microcell zones can increase interference especially near the boundaries of zones.
- (iv) GSM is the digital standard for Europe; What do the letters GSM currently mean?  
 (a) Global Special Mobile (b) Greater System's Mobile  
 (c) Global Systems for Mobile (d) None of the above.
- (v) Among the following which one is used when two WLAN stations are in a dialog exchange?  
 (a) SIFS (b) DIFS (c) EIFS (d) PIFS.

- (c) Assume a cluster of N hexagonal cells arranged in a larger (almost) hexagonal structure as follows:  
 From the center cell of the cluster A, move i distance to one axis and then j distance to a direction 120 degrees to it (as is done in a regular cell cluster formation). This will give the center cell B of the next cluster. A and B can have similar channel configurations as they are widely separated and there is no threat of interference.  
 Let the distance between the centers of A and B be 'D'.  
 Express 'D' in terms of 'i' and 'j'.  
 Find the area of the large hexagon (i.e. the cluster of cells).  
 This is (apprx.) equal to the total cell areas of N cells (each small cell area is computed in (b) above, so please use the result).  
 From this observation prove that:

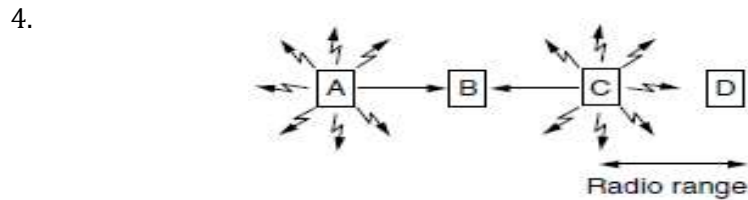
$$N = i^2 + i*j + j^2$$

$$4 + (2 + 2) + 4 = 12$$

3. (i) What do you mean by the small cell concept?  
 (ii) Is it true that in 5G there is a possibility of interference being more?  
 (iii) Mention one D2D communication scenario.  
 (iv) How can the latency be reduced in a 5G network?  
 (v) Point out some characteristics of the Massive MIMO technology.  
 (vi) Millimetre wave technology is very much prone to environmental absorption. How can this property be utilized by 5G to enhance capacity?

$$(6 \times 2) = 12$$

**Group - C**



- (i) Is it Hidden or Exposed Station Problem?  
 (ii) Show the other type of problem in a diagram.  
 (iii) Suppose A is transmitting to B. How can you ensure a concurrent transmission from C cannot garble up the communication between A and B?  
 (iv) Now B is transmitting to A. Can a transmission from D to C happen at the same time?  
 [Note: C is in the transmission range of B].  
 You may assume the existence of CSMA/CA protocol for cases (iii) and (iv).

- (v) What is the difference between CSMA/CA and RTS/CTS based protocols?

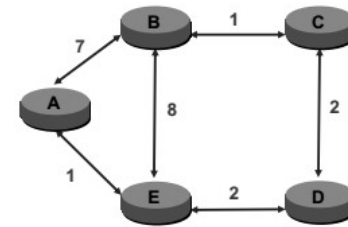
$$(2 + 2 + 3 + 3 + 2) = 12$$

5. (a) Consider that you are a resident of Kolkata and have a Mobile IP enabled mobile phone. Now, you have been posted in New Delhi for some short term training for a week and it is expected that for that short period you will not take a new SIM. What are the procedures that are to be executed by the network from the Mobile IP perspective?  
 (b) How does the network handle a call destined to you, initiated by your friend located at Bangalore?

$$6 + 6 = 12$$

**Group - D**

6. (a) Consider a network as given in the figure. Explain how the Distance Vector routing algorithm will exchange information of the nodes to update the routing table in each of the nodes till they reach a stable state.



- (b) Explain the count to infinity problem with suitable example?  
 (c) What is a cognitive radio? What are the various phases of operation of a cognitive radio?

$$8 + 2 + 2 = 12$$

7. (a) Construct the all node shortest path of the following graph using Dijkstra's Algorithm. Consider Node 1 as the source node.

