

9. (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).

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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) Describe some specialities of the Virtual Machine environment available within the Android system.

6 + 3 + 3 = 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**
- 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.
 - How many slaves can be connected to the master using SCO links in Bluetooth?
(a) 3 (b) 4 (c) 5 (d) 7.
 - 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.
 - Which of the following is not a method of implementing Cognitive Radio Technology?
(a) Overlay (b) Interweaved (c) Underlay (d) Disjoint.
 - Hidden Terminal Problem can be solved using_____.
(a) RTS/CTS (b) CSMA/CD (c) CSMA/CA (d) CDMA.

- (vi) A wireless network provides immediate connection anywhere in the wireless range of its _____.
 (a) access point (b) routers (c) bridges (d) gateways.
- (vii) How to pass the data between activities in Android?
 (a) Intent (b) Broadcast Receiver
 (c) Content Provider (d) none of the above.
- (viii) Which of the following combination regarding Bluetooth is false?
 (a) SCO packets: FEC (Forward Error Correction)
 (b) SCO packets: Retransmission
 (c) ACL packets: FEC
 (d) ACL packets: Retransmission.
- (ix) What is off-line synchronization in Android?
 (a) Synchronization with internet (b) Background synchronization
 (c) Synchronization without internet (d) none of the above.
- (x) How many orientations do Android support?
 (a) 2 (b) 8 (c) 4 (d) 10.

Group - B

2. (a) Consider a deployment region of area 'A' is covered by imaginary hexagonal cells of area 'a' each. Now, if the total number of channels is 'T', calculate the system capacity for cluster size of seven.
 (b) What will be the system capacity if the cluster size in the above problem is reduced from seven to four? Give a suitable explanation of the observation.
 (c) Explain how the cluster size affects the system capacity.
 (d) Which other parameters do you think affect the capacity of a system and how?
3. (a) What is a channel? State the necessity of channel assignment.
 (b) Explain a channel assignment scheme of your choice with suitable diagram.
 (c) State the limitations of the AMPS technology. How does the GSM technology overcome the limitations of AMPS?
 (d) How is the location update procedure work in a GSM network? In this context explain the IMSI Attach and Detach procedures.

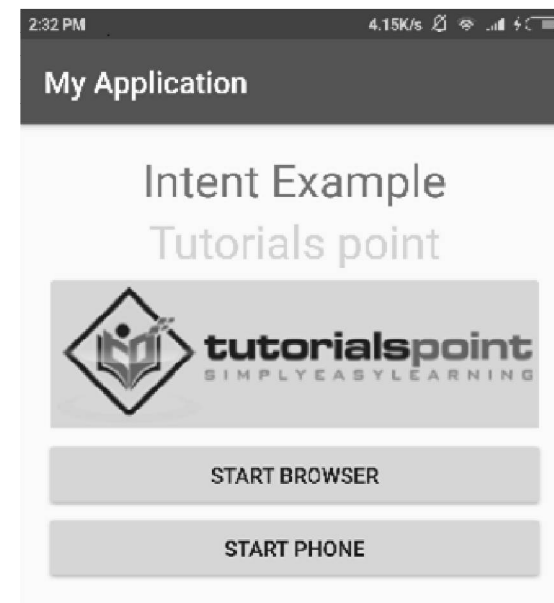
$$2 + 3 + 3 + (2 + 2) = 12$$

Case 2: Around the same time P wants to send traffic to D. Show the Reverse and Forward Path setup in this case also.
 You may assume the link cost between any two nodes is a fixed value (say 1).

$$(3 + 1) + (4 + 4) = 12$$

Group - E

8. (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?



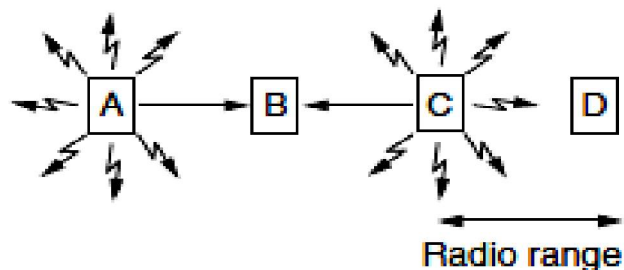
(ii) Write Java code to display the above Android screen. When the user presses "Start Browser", a corresponding webpage www.abc.com will open. Show the Intent related code in particular. Also show the Manifest and other relevant files. Only specify the relevant portion which need be modified in each case.

- (c) Clearly distinguish among the following concepts within an Android system: Applications, Application Framework, Activities and Services.

$$(1 + 3) + (1 + 3) + 4 = 12$$

Group - C

4. (a)



- (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?

- (b) What are the modifications of I-TCP over conventional TCP (for wireline environment)? What are the reasons for these modifications?

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

5. (a) In each case below mention which layer of the Bluetooth protocol is responsible for handling the specified functionality. Also in each case for that layer mention another functionality.

- (i) Frequency hopping
- (ii) Piconet connections
- (iii) Adaptation of upper layer protocols to baseband layer.

- (b) Consider two mobile hosts MH1 and MH2. HA1 is home agent for MH1. HA2 is home agent for MH2. Their respective foreign agents are FA1 and FA2. Consider the following situations:

- (i) MH2 moves to the foreign network under FA2. Describe stepwise how MH2 gets a new IP address.
- (ii) MH1 (still under HA1) tries to send a data packet to MH2 (under FA2). Show the IP packet and how it is routed.
- (iii) MH1 now moves to the foreign network under FA1. MH2 continues in its foreign network. Show how an IP packet is routed from MH1 to MH2.

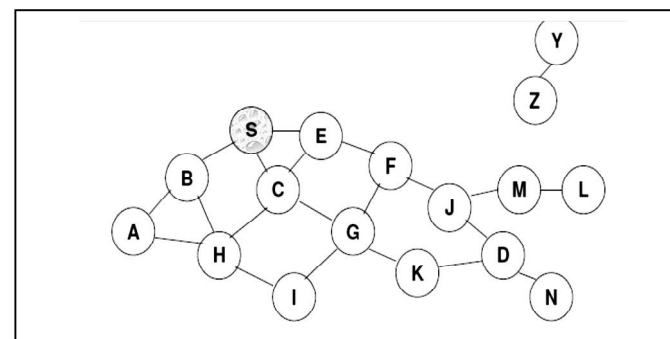
$$(3 \times 2) + (2 + 2 + 2) = 12$$

Group - D

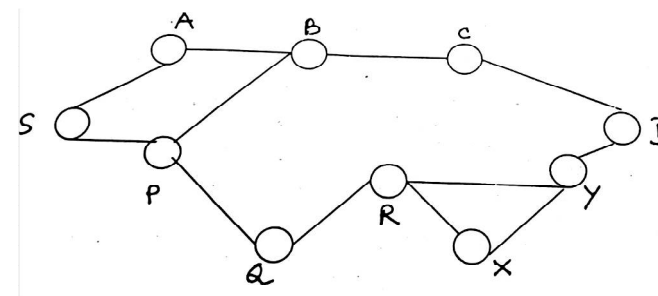
6. (a) Mention two reasons why HTTP and HTML are not suitable for WWW access from mobile devices. Mention two support systems in place for mobile WWW.
- (b) Mention some unique challenges faced by routing algorithms in a WSN (Wireless Sensor Network). Describe one technique to address such a challenge.
- (c) Explain with an example how Dynamic Spectrum Access is achieved in CRN?

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

7. (a)



Consider the above network. Show the DSDV routing table for the node S for six destinations (of your choice). Also show the updates only in this table when the node Z gets attached to S after coming to close proximity of it.



Consider above network and the following situations.

Case 1: S wants to send traffic to D for the first time. Show the Reverse Path and Forward Path setup if AODV protocol is used.