

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

SEMESTER FINAL EXAMINATION
DURATION: 3 Hours

SUMMER SEMESTER, 2015-2016

FULL MARKS: 150

CSE 4805: Wireless Networks

Programmable calculators are not allowed. Do not write anything on the question paper.
There are 8 (eight) questions. Answer any 6 (six) of them.
Figures in the right margin indicate marks.

- a) Describe the necessity of Internet Standards. 4
- b) Why does *wireless MAN* (Metropolitan Area Network) require a new standard? Why does not just to use IEEE 802.11 standard? 7
- c) Mention few energy efficient approaches in extending network life-time of a *Wireless Sensor Networks* (WSNs). 6
- d) What is *RFID*? Briefly discuss the components constituting an *RFID* system. 8
- a) Conventional *Wi-Fi* networks perform channel contention in time domain. However, time domain contention mechanism possesses greater channel wastage due to its channel contention mechanism. 5+9
 - i. Address specific reasons behind such inefficiency caused by time domain contention.
 - ii. Elaborately discuss a promising channel contention approach which effectively overcomes this limitation.
- b) What are the fundamental requirements addressed by *Delay Tolerant Networking* (DTN)? 6
- c) What are the differences between an active tag and a passive tag in *RFID* system? 5
- a) Anan is being pressured to reduce his company's expenses for their two storied corporate office. After talking with experts he decided to install *Wireless Sensor Network* (WSN) in office building to automate energy usage in a smarter way. 13

On behalf of Anan, design a perfect network model mentioning its architecture and working principle. However, network architecture should include details of the required sensors and actuator components with their placement information. Consider any sample building architecture prior to designing the network model.
- b) What is meant by *Routing Metric*? What are the general optimization objectives of any routing metric design? 7
- c) "A *Bluetooth* device can be in two pico-nets but cannot be the master in both of them at the same time" - Justify the claim with respect to *Bluetooth* architecture. 5
- a) Clarify the motivation for *Receiver Initiated Collision Avoidance* in brief. 6
- b) How does a station perform the *back-off procedure* in *DCF* (Distributed Coordination Function) after its unsuccessful transmission? 7
- c) *Timing Synchronization Function* (TSF) synchronizes all the stations within an *Independent Basic Service Set* (IBSS) to a common clock. Let an IBSS, which consists of 4 stations A, B, C, and D, and their present clock times are 14.00, 14.08, 13.55, and 14.05 respectively. Discuss the time synchronization procedure followed by these stations in the given scenario. 6
- d) How can different *Inter Frame Spaces* (IFS) ensure prioritized access in shared channel? 6

5. a) How can you calculate the ETX path metric for multi-hop wireless networks? Mention its limitation.
- b) Draw a flow chart to clarify the route discovery procedure in *Dynamic Source Routing (DSR)* protocol.
- c) Draw a diagram illustrating the architecture of a *Satellite Communication System*.
- d) How does the *Vehicular Ad-Hoc Network (VANET)* work? Propose a potential VANET application for a developing country.

6. a) An IBSS consist of three stations (*A, B, C*) follows IEEE-802.11e standard in ensuring quality of service data delivery. Each station contends for shared medium in a distributed manner. Moreover, each of them maintains two Access Category (AC), one for handling high priority data and another for low priority data.

Draw a time line diagram showing one successful transmission of high priority MSDU data from station *A* to station *C*. The diagram should include the back-off process of all the back-off entities which includes the back-off slots, DIFS period and the SIFS period. Note that, the X-axis of the diagram shows time and Y-axis shows one horizontal line for each containing back-off entities.

- b) Write a comparative analysis on *Proactive* and *Reactive Routing Protocols*.

7. a) What exactly is the *Internet of Things (IoT)*? Discussion on '*life in an IoT era*'.
- b) "Traditional TCP scheme may suffer from severe performance degradation in a wireless environment" - Justify the statement.
- c) Mention one approach that improves wireless TCP performance.

8. a) Clarify the weakness of *Distance-Vector Routing Protocol* by presenting a sample traffic flow diagram.
- b) What is the fundamental idea of *Sensor-MAC (S-MAC)* protocol?
- c) How is the *QoS (Quality of Service)* assured in IEEE 802.16 MAC?