جـــــامعة المنصـــــــورة
كـــــلية الهـندســـــــة
قسم هندسة الحاسبات والنظم
الفرقة تمهيدى ماجستير تحكم آلى

امتحان مادة : نظم تحكم بالحاسبات
كـود المـــــادة : CSE 6704
تاريخ الامتحـان : ١ / ٩ / ٢٠١٣
الزمن ٣ ساعات- الدرجة من ١٠٠

[1-a] What does the following terms mean? [5 marks]

SPI	I^2C	MAC	GAF	DSDV
AODV	OLSR	GEAR	LEACH	PAMAS

[1-b] Name at least four techniques to reduce power consumption in WSN. And describe a WSN application categories. [5 marks]

[1-c] What is the difference between a proactive routing protocol and a reactive routing protocol? Name at least two examples for each category. Consider the following WSN scenarios and explain why you would choose either a proactive or a reactive routing solution:
(i) A WSN is used to measure humidity in a field, where low-power sensors report measurements only when certain thresholds are exceeded.
(ii) A WSN is used to detect the presence of vehicles, where each sensor locally records the times of vehicle detection. These records are delivered to the base station only when the sensor is explicitly queried. [9 marks]

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[2-a] Write short notes on the following:- [8 marks]

i- Data freshness. ii- Node architecture.
iii- Challenges of WSN. iv- Types of attacks in WSN.

[2-b] Explain briefly how can [10 marks]
(i) concurrency supported in TinyOS.
(ii) oversampling of sensor data overcome the effect of noise.
(iii) an acoustic sensor can be used to monitor the content of a pipeline.
(iv) a magnetic sensor be employed to measure the movement of vehicles.
(v) a local power management strategy achieve an efficient power consumption in a wireless sensor node.

[2-c] Consider the network topology in Fig.1, where circles indicate the communication and interference range of each node, that is each node can hear the immediate neighbors to the left and right. Assume that RTS/CTS is not being used.
(i) Node C sends to node B and node E wants to send to node D. Is E allowed to do so and will it do so? [3 marks]
(ii) Node A sends to node B and node D sends to node C. Which other nodes are allowed to send at the same time? [3 marks]

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[3-a] Give three reasons for supporting dynamic reprogramming in WSNs. And explain how both SOS and TinyOS deal with it. [6 marks]

[3-b] Describe the main problems in using CSMA as a medium access control mechanism in a WSN. And why in a CSMA/CA network, nodes use a random delay before accessing the medium?. [6 marks]

[3-c] Fig. 2 shows a number of nodes as small dots. Each node has a radio range of 2 units. How would the gray node positioned at (0, 0) route a packet to the gray node at position (9, 9) using GPSR? Indicate the visited nodes. [8 marks]

من فضلك اقلب الورقة

[4-a] What are the specific features of the IEEE 802.11 PSM and what are the main difficulties of using it in WSNs?. And explain why is the IEEE 802.15.4 standard preferable over the IEEE 802.11 standard for most WSNs?. [6 marks]

[4-b] (i) Discuss why overhearing is a problem in a WSN, and explain how PAMAS addresses this problem. [3 marks]
(ii) Explain briefly T-MAC's ability to adapt the traffic density. And how does it address the "early sleeping problem". [3 marks]

[4-c] Consider the network topology in Fig. 3 where the lines indicate which nodes can interfere and communicate with each other. Assume a TDMA protocol with a frame size of 5 slots and that each node can only be sender or receiver during any time slot.
(i) Generate a schedule such that every node has an opportunity to communicate to all its neighbors. [4 marks]
(ii) For your schedule, how many slots in a frame could each node sleep to preserve energy? [3 marks]
(iii) Assume that node A sends a message to node E; how long does it take for E to receive the message using your schedule? (Explain your answer). [3 marks]

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[5-a] Give three reasons why dynamic power management is a crucial concern in WSNs. Give an example how a global power management can be realized at the link layer. [5 marks]

[5-b] Why is time of synchronization needed in a WSN? Name at least three concrete examples. And explain why nondeterminism of communication latencies affects the time of synchronization. [5 marks]

[5-c] Explain some of the characteristics of a WSN that make routing security difficult to be implemented . And why do you think authentication can be a particularly significant problem in a WSN? [5 marks]

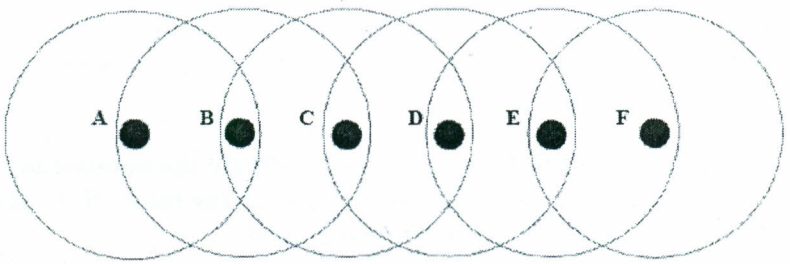

Fig. 1

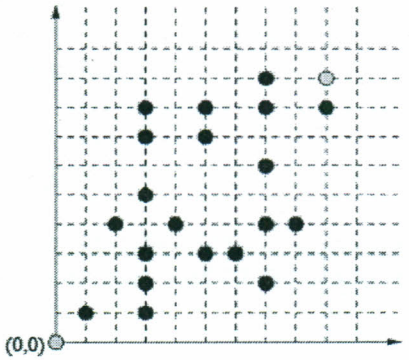

Fig. 2

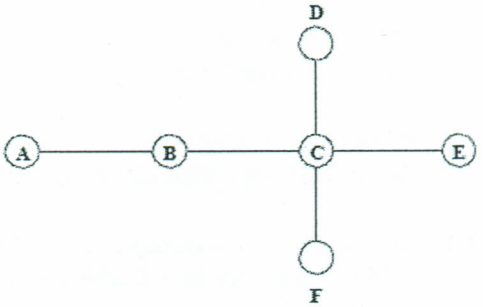

Fig. 3

مع تمنياتى بالتوفيق والسداد
أ.م.د. محمد شريف مصطفى