

**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY**

B.Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2015

Department of Electronics and Communication Engineering

ECE 4259

(Wireless Sensor Networks)

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.  
ii) Figures in the right margin indicate full marks.

**SECTION A**

(Answer **ANY THREE** questions from this section in Script A)

1. a) What are the characteristics of wireless sensor networks (WSNs)? Explain the design and operational challenges of wireless sensor networks (WSNs). (05+10)
- b) What are the applications of wireless sensor networks? Explain the traffic management and monitoring scheme by using wireless sensor network. (05+03)
- c) What are the components of a sensor node? Explain the typical architecture of the sensor node. (05+07)
  
2. a) Define source and sink nodes. Explain typical operations of a sink node. (04+04)
- b) What are the advantages and disadvantages of multi-hop networks over single-hop network? (06)
- c) Explain quality of service and different mobilities of wireless sensor networks. Explain most common aspects of energy efficiency of wireless sensor networks. (07+07)
- d) Design a standard transceiver in wireless sensor networks. (07)
  
3. a) Explain proactive and reactive routings of wireless sensor networks. What is data aggregation process? (04+03)
- b) Illustrate the pros and cons of flat-based and hierarchical-based routing. (12)
- c) What are the drawbacks of flooding and gossiping protocols? Draw the routing paths for both the flooding and gossiping protocols of the network shown in Fig. 3(c). (05+06)

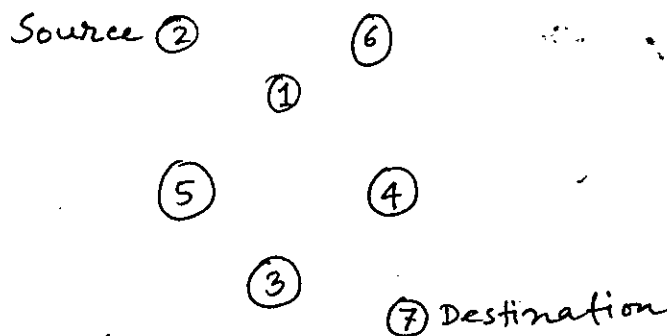


Fig. of 3(c)

- d) Distinguish between RBS and TTS. (05)
  
4. a) How to store data that is generated as well as transmitted in WSNs? (09)
- b) Explain the hidden node and exposed node problems with solutions. (10)
- c) Construct MAC layer frame format for Zigbee enabled system? (09)
- d) List different network congestion avoidance mechanisms. What are the conditions for a secure sensor network? (07)

## SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) Provide some components which are necessary to form a wireless mesh network (WMN). (08)  
b) Distinguish between conventional nodes and WMN nodes. (07)  
c) Explain some application scenarios of WMNs (minimum four cases). (12)  
d) Define WMN. What are the differences between WMN and ad-hoc network? (08)
  
6. a) What do you mean by scalable multi-channel MAC protocol? What is the principle of multi-channel multi-transceiver MAC protocol? (05+08)  
b) Define adaptive TCP. What is the effect of large RTT variations in WMN? (03+04)  
c) Explain the important issues of application layer in WMN. (15)
  
7. a) What is WPAN? Explain the IEEE standard of WPAN. (03+07)  
b) Show that the superframe format greatly affects the performance of WPAN. What are the differences between PCF and DCF superframe? (05+08)  
c) Briefly explain MANET protocol stack. Also, explain clusterhead gateway switch routing (CGSR). (12)
  
8. a) Provide the definition of body area network given by IEEE. Draw a wireless BAN containing node, base station and database. (12)  
b) How do you monitor a patient through BAN? (05)  
c) What are the factors that influence ad-hoc network performance? (09)  
d) Show IEEE 802 protocol layers compared to OSI model. (09)

# KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2015  
Department of Electronics and Communication Engineering  
ECE 4205  
(Satellite Communications and Radar)

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.  
ii) Figures in the right margin indicate full marks.

## SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) Define communication satellite. Why is it unique? (09)  
b) Write down the advantages and disadvantages of geostationary satellite? (08)  
c) Why are the uplink and downlink frequencies different in satellite communications? (08)  
d) Describe two body equation on motion in relative form. (10)
  
2. a) State and explain Kepler's law. (10)  
b) Discuss the launching of a satellite into a geostationary orbit mentioning all the velocity component at each stage of this process. (10)  
c) Deduce the expression of slant range for a communication satellite. (08)  
d) Calculate the apogee and perigee heights for a satellite having major axis 7192.335 km, eccentricity 0.0011501 and radius of the earth is 6371 km. (07)
  
3. a) Write down the advantages and disadvantages of Cassegrain antenna over paraboloid antenna in an earth station. (05)  
b) Figure 3(b) shows the receive side of an earth station. Express the earth station system noise temperature referred to the input of the low-noise amplifier. (10)

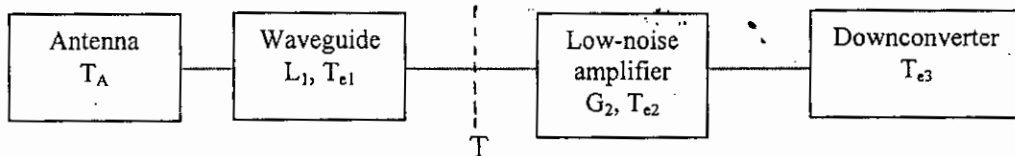


Figure 3(b) Receive side of an earth station antenna

- c) Describe three axes stabilization method for attitude control of a satellite. (07)
- d) Find the earth coverage angle, communication coverage angle and slant range of a satellite from which it is visible at minimum elevation angle  $E_{\min}=10^\circ$  for the following circular orbit (i) Geostationary (ii)  $H=1500\text{km}$ . (13)
  
4. a) For a basic satellite link, deduce the uplink carrier to noise ratio in decibels. (10)  
b) Considering the effect of interference signal, prove that  $\frac{C}{N} = \left[ \left( \frac{C}{N} \right)_u^{-1} + \left( \frac{C}{N} \right)_d^{-1} \right]^{-1}$ , where symbols have their usual meanings. (10)  
c) Describe the effect of rain attenuation on system noise temperature. (07)  
d) What is the role of  $G/T$ ? An earth station antenna has a diameter of 30m, has an overall efficiency of 68% and signal frequency of 4.15GHz. If the system noise temperature is recorded to be 79K, what is the  $G/T$ ? If heavy rain causes the sky temperature to increase so that noise temperature rises to 88K, what is the new  $G/T$  value? (08)

## SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) Explain the basic principle of operation of radar with suitable block diagram. (07)
- b) Define pre detection integration and post detection integration for radar range calculation. (04+05)  
Why is post detection integration preferred?
- c) Define Johnson noise and noise figure. Considering the receiver noise find out the value of target's distance from the radar. (04+08)
- d) Calculate the maximum range of a radar system which operates at 3cm with a peak pulse power of 500 kw, if it's minimum receivable power is  $10^{-13}$  w, the capture area of it's antenna is  $5 \text{ m}^2$  and the radar cross sectional area of the target is  $20 \text{ m}^2$ . (07)
6. a) Define probability of false alarm. Establish the relation between probability of false alarm and false alarm time. (12)
- b) Draw the block diagram of conical scan tracking radar and describe its feeding system. (08)
- c) What is flicker effect? Explain with suitable diagram. (06)
- d) The average time between false alarms is specified as 30 min and the receiver bandwidth is 0.4 MHz. (i) What is the probability of false alarm? (ii) What is the threshold-to-noise power ratio  $\left(\frac{V_T}{Y_0}\right)$ . (09)
7. a) What is the greatest shortcoming of simple CW radar and how can it be overcome? (04+08)
- b) What do you mean by sequential lobing and simultaneous lobing? (07)
- c) Write down the limitations of tracking accuracy for tracking radar. (06)
- d) Write down the names of different types of display used in radar and describe PPI and RHI display. (10)
8. a) Write down the least five important differences between two air traffic control radar ARSR-3 and ASR-8. (10)
- b) What are the ways that solid state devices can be employed in radar? (07)
- c) What are the functions of an antenna during the operation of a radar? (08)
- d) Write down the names of RF sources for high power radar applications. (10)

**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY**  
B.Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2015  
Department of Electronics and Communication Engineering

Hum 4209  
(Industrial Management & Accounting)

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.  
ii) Figures in the right margin indicate full marks.

**SECTION A**

(Answer **ANY THREE** questions from this section in Script A)

1. a) Define management. Discuss the various concepts of management. (09)  
b) Write down the functions of management. (10)  
c) State the principles of management. (08)  
d) Differentiate between administration and management. (08)
  
2. a) Define recruitment. (05)  
b) State the external sources of recruitment. (10)  
c) What are the advantages of recruitment? (10)  
d) What are the limitations of recruitment? (10)
  
3. a) What do you mean by merit rating? (05)  
b) State the features of merit rating. (10)  
c) Discuss the objectives of merit rating. (10)  
d) Explain the importance of merit rating. (10)
  
4. a) State the marketing concepts. (09)  
b) Discuss the functions of channel of distribution. (09)  
c) What are the purposes of advertisement? (09)  
d) If you were the chief executive officer of a large corporation, how would you "institutionalize" ethics in the organization? (08)

**SECTION B**

(Answer **ANY THREE** questions from this section in Script B)

5. a) Describe the major functions of accounting. (10)  
b) Who are the users of accounting information? Explain. (10)  
c) What is accounting equation? What are the elements of accounting equation? (10)  
d) Define adjusting entries. Discuss the importance of adjusting entries. (05)

6. a) How does journalizing differ from ledger? (10)
- b) The City Park was started on September 01, 2015 by Kazi. The following events transactions occurred during September: (25)
- 2015 September-1 Invested cash TK 200,000 in business.
- 2015 September-3 Purchased land costing TK 150,000 in cash.
- 2015 September-5 Incurred advertising expense TK 3,000 on cash.
- 2015 September-7 Paid salaries to employees TK 12,000.
- 2015 September-10 Hired a manager for the park at salary of TK 25,000 per month effective October 1.
- 2015 September-12 Paid TK 1,800 for six month insurance policy.
- 2015 September-13 Received TK 10,500 in cash for entrance fees.
- 2015 September-14 Withdraw TK 3,000 cash for personal use.
- 2015 September-20 Sold 200 coupon books for TK 25 each in cash.
- 2015 September-25 Received TK 8,500 in cash for entrance fees.
- 2015 September-29 Paid TK 3,000 on account for advertising incurred in September 5
- 2015 September-30 Stationary goods purchase in cash for office TK 1,000.

Required: Journalize above the transactions.

7. a) What is the primary purpose of a Trial balance? (05)
- b) What are the limitations of a Trial balance? (05)
- c) From the following particulars, prepare a cost sheet of ABC manufacturing company. (15)

Raw materials used..... TK 134,000

Work-in-progress 01.03.15..... TK 52,000

Work-in-progress 31.03.15..... TK 65,000

Finished goods 01.03.15..... TK 50,000

Finished goods 31.03.15..... TK 40,000

Direct wages 14,000 hours @ TK 4 per hour.

Other direct expense.....TK 15,500

Factory supplies.....TK 14,000.

Indirect labour .....TK 8,000.

Miscellaneous factory expenses.....TK 12,000.

Administrative expenses.....TK 20,000.

Selling expenses.....TK 5,000.

Profit 20% on sales.

- d) The employees worked in Account Section of Khulna Traders. Information relating salaries for the month of June, 2015 as follows: (10)

	Name of the employees		
	Raju	Rahi	Adi
Basic Salaries (TK)	23,000	18,000	15,000
House rent (% of basic salaries)	50%	50%	50%
City allowance (% of basic salaries)	20%	20%	20%
Medical allowance (TK)	1,000	1,000	1,000
Charge allowance (TK)	2,500	---	---
Overtime (Hours)	20	25	30
Employee contribute to provident fund	10%	10%	10%
Contribute to benevolent fund (TK)	200	100	100
Bonus	23,000	18,000	15,000

During the month, normal working hours were 200 hours. Overtime allowance double of the basic salaries per hour. Deduct from Mr. Raju for computer loan yearly TK 3,600 and house building loan deduct from Rahi's salary per month TK 500.

Required: Prepare payroll sheet for the month of June, 2015.

8. The following Trial Balance has been extracted from the General ledger of Mr. Amin.

Mr. Amin Trial Balance as on December 31, 2015		
Title of account	Debit (TK)	Credit (TK)
Cash	30,000	
Accounts Receivable	60,000	
Inventory (1-1-15)	42,000	
Office equipment	28,000	
Accounts payable		48,000
Notes Payable		18,000
Insurance expense	4,000	
Office supplies expense	2,800	
Rent expense	3,600	
Office salary expense	7,000	
Drawings	5,400	
Advertising expense	1,000	
Delivery expense	3,000	
Purchase	90,000	
Sales		1,38,000
Transportation-in	1,200	
Purchase returns		3,000
Sales returns	4,000	
Capital		75,000
Total TK	2,82,000	2,82,000

Adjusting data (i) Inventory on 31<sup>st</sup> December 2002 is valued at TK 51,000.

(ii) Depreciation of office equipment is TK 3,600. (iii) Insurance unexpired is TK 1,200.

Required: (a) Prepare a statement of comprehensive income for the year ended 31<sup>st</sup> December, 2015.

(b) Prepare owner's equity statement and

(c) Prepare a statement of financial position as on 31<sup>st</sup> December, 2015.





**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY**  
B.Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2015  
Department of Electronics and Communication Engineering  
ECE 4203

(Telecommunication Engineering)

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.  
ii) Figures in the right margin indicate full marks.

**SECTION A**

(Answer **ANY THREE** questions from this section in Script A)

1. a) Define and classify the switching system of a telecommunication network. Also draw a figure that shows the different elements of a switching system and their logical interconnections. (12)  
b) Describe signaling tones in automatic exchanges with necessary diagrams. Differentiate between strowger and crossbar switching systems. (12)  
c) Design 100-line switching system with uniselectors. Also calculate traffic handling capacity, equipment utilization factor, cost capacity index. (11)
2. a) Draw the functional block diagram of a common control switching system. Discuss in brief the event processing and call processing blocks. (12)  
b) Design a touch tone dialing scheme with required tone frequencies. Describe briefly the protection schemes against "talk-off". (12)  
c) Design a 3×3 crossbar switching. Mention the procedure for establishing a connection in a crossbar switch. Define diagonal crosspoint matrix. (11)
3. a) Discuss in brief the different modes for dual processor based centralized stored program control. Use necessary figures in your discussion. (12)  
b) Define the expressions for "Availability" for single processor and dual processor based electronic space division switching system. (12)  
c) Calculate the maximum access time that can be permitted for the data and control memories in a time multiplexed time switching with a single input and single output trunk multiplexing 2500 channels. Also mention the cost of the switch. (11)
4. a) Explain the working principle of input-controlled TDSS. What are the fundamental differences between TDSS and TDTS? (10)  
b) Write down the differences between micro-programmed control and hard-wired control schemes. (06)  
c) Show that a two stage non-blocking network requires twice the number of switching elements as the single stage non-blocking network. (09)  
d) Calculate the access time of the memory modules in parallel-in/serial-out time switch using 64 input and 64 output streams with each stream multiplexing 32 channels. Consider the time multiplexed time switching with non-overlapped operation. (10)

**SECTION B**

(Answer **ANY THREE** questions from this section in Script B)

5. a) Show that, the carbon granule microphone acts as an amplitude modulator. (10)  
b) "The total number of links  $L$  with  $n$  entities is expressed as  $L = \frac{n(n-1)}{2}$ " – Justify (08)  
it. What is the bottleneck of this proposition?

- c) "Too much sidetone and complete absence of sidetone is undesirable"-Justify the statement. (07)
- d) In the circuit of figure 1(d), it is desired that 20 percent of the microphone signal is heard as sidetone. If the number of turns in the coil P is 200, determine the number of turns in the coil Q and the secondary winding in the earphone circuit. Assume that  $Z_b$  is exactly matched to the line impedance on the exchange side. (10)

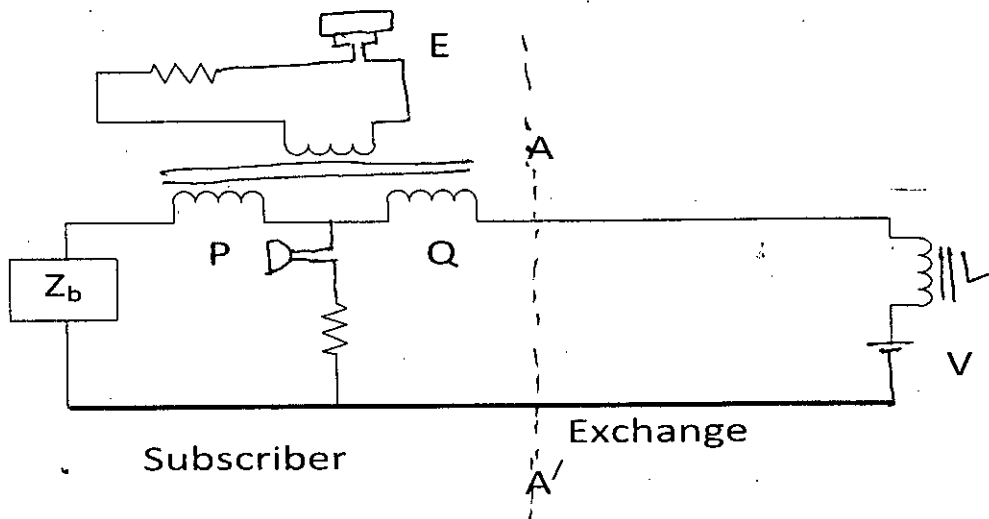


Figure 5(d)

6. a) Draw the functional block diagram of a standard telephone set and explain it briefly. (10)
- b) Draw the DTMF keypad layout with its frequency allocation. (05)
- c) Explain the operation of an echo suppressor with necessary circuit diagram. (10)
- d) A exchange uses -40V battery to drive subscriber lines. A resistance of  $250 \Omega$  is placed in series with the battery to protect it from short circuits. The subscribers are required to use a standard telephone set which offers a d.c resistance of  $50 \Omega$ . The microphone requires 23 mA for proper functioning. Determine the farthest distance from the exchange at which a subscriber can be located if 26 AWG conductor is used. Note that the specifications of 26 AWG are: Diameter (mm): 0.41, d.c resistance ( $\Omega/\text{km}$ ): 133.89, Attenuation (dB/km): 1.61. (10)
7. a) Define the following terms: (i) 1 Erlang, (ii) BHCA, (iii) CCR, (iv) GoS. (10)
- b) Explain the protocol architecture of SS7. What is the relationship between SS7 and ISO-OSI model? (11)
- c) Briefly discuss the terms "pure-chance traffic" and "statistical equilibrium". (05)
- d) In the path profile of a microwave link of 25 km, a hill of height 70m with trees is encountered at a distance of 10 km from the transmitting end. Carrier frequency is 6 GHz. Determine the tower height required. Assume a correction factor of 0.9 for ray bending. (09)
8. a) Define queuing system and lost call system. (05)
- b) During the busy hour, 1200 calls were offered to a group of trunks and six calls were lost. The average duration was 3 minutes. Find: (i) the traffic offered (ii) the traffic carried (iii) the traffic lost (iv) the grade of service (v) the total duration of the periods of congestion. (10)
- c) For a queuing systems, show that (10)
- $$P(x) = \frac{N^N}{N!} \left( \frac{A}{N} \right)^x P(0),$$
- where symbols have their own meanings for telecommunication traffic theory.
- d) A group of 20 trunks provides a grade of service of 0.01 when offered 12E of traffic. (10)
- (i) How much is the grade of service improved if one extra trunk is added to the group? (ii) How much does the grade of service deteriorate if one trunk is out of service?

**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY**  
B.Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2015  
Department of Electronics and Communication Engineering  
ECE 4227  
(Biomedical Engineering)

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.  
ii) Figures in the right margin indicate full marks.

**SECTION A**

(Answer **ANY THREE** questions from this section in Script A)

1. a) Describe the design process of typical medical instruments. (09)  
b) What is bio-potential? Describe the different types of bio-potential. (15)  
c) How does power line signal contaminate the ECG? How can you minimize these interferences? Explain in details. (11)
2. a) What is EEG? Write short note on Alpha activity of EEG signal. (07)  
b) Draw and explain the working principle of an amplifier circuit that can be used with micro-pipette intracellular electrodes. (08)  
c) How can you detect the failure of leads during ECG measurement? Explain using necessary circuit diagram. (07)  
d) Define bio potential electrode and explain its working principle. Also, draw the equivalent circuit of microelectrode (metal) placed into a cell. (13)
3. a) Why are the isolation amplifiers necessary in medical instrumentation? Draw and explain the operation of transformer coupled isolation amplifier circuit. (12)  
b) What are the functions of defibrillators? Classify dc defibrillators and explain the working principle of any one of them. (12)  
c) Write down the susceptibility parameters and factors regarding electrical safety. Also, illustrate the good grounding method to avoid shock hazards. (11)
4. a) What is MRI? Describe the spin wobbling effect of MRI. (12)  
b) Explain the basic principle of optical imaging. Also, compare different optical imaging techniques used in biomedical applications. (12)  
c) What is ultra sound? Describe the basic principle of Doppler ultrasound flow imaging method. (11)

**SECTION B**

(Answer **ANY THREE** questions from this section in Script B)

5. a) What is X-ray? Explain the construction and operation of X-ray tube. (13)  
b) Describe the anode heel effect in X-ray tube. (10)  
c) What are the usual supply voltages for X-ray generation? Explain different circuits used for supplying voltage into X-ray tube. (12)
6. a) What is surgery? What types of equipment are needed for Operating Room (OR)? (06)  
b) What do you mean by ICU/CCU? How many types of ICU and describe them in brief. (12)  
c) Draw and explain the block diagram of a bed side patient monitoring system. (08)  
d) Draw the block diagram of central monitoring system of ICU. (09)

7. a) What is biosensor? What factors are needed to consider for biosensor development? Explain. (08)  
b) Describe the basic components of biosensor using necessary diagrams. (08)  
c) How can you measure glucose using biosensor? Explain. (07)  
d) Describe the electro-chemical DNA bio-sensor. (12)
8. a) What is pacemaker? Draw different types of waves used in pacemaker mentioning their suitability on specific disorders. (11)  
b) Describe the operations of (i) Unipolar stimulating circuit; (ii) Bipolar stimulating circuit with necessary diagrams. (15)  
c) What are the characteristics of load for pacemaker? (09)