

**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY**

B.Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2017

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 and challenges of wireless sensor networks? (12)  
b) Explain different mobility scenarios of wireless sensor network. What are the common aspects of energy efficiency? (04+04)  
c) What is meant by ISM band? Explain the ISM bands used in wireless sensor networks with its challenges. (03+06)  
d) What do you mean by QoS in WSN? (06)
2. a) Why is localization required in wireless sensor networks? Explain different distance estimation methods in wireless sensor networks. (02+08)  
b) What is data aggregation? Explain the PADS and MRS schemes. (03+08)  
c) Explain important synchronization problems of wireless sensor network. (08)  
d) Explain the neighbor discovery method in wireless sensor network. (06)
3. a) Explain energy consumption of a routing path. Explain the relationship between number of retransmission and probability of packet error rate. (05+03)  
b) Assume the crossover distance is 40m,  $E_c=50$  nj/bit,  $e_1=10$  pj/bit, and  $e_2=0.0013$  pj/bit. Calculate the total energy required from source to destination of Fig. 3(b). Also calculate the number of bits received in the sink node. (16)

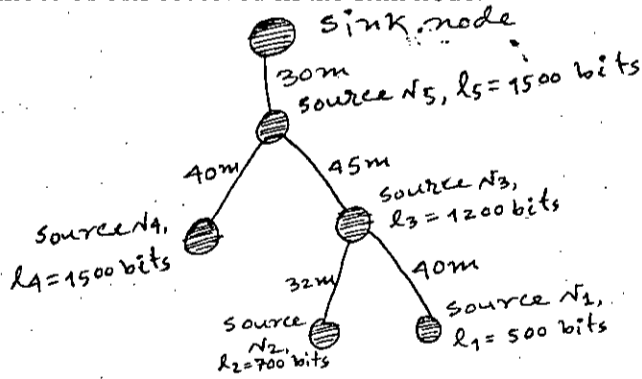


Fig. 3(b)

- c) Explain major hierarchical routing algorithms used in wireless sensor network. (11)
4. a) What are the functions of beacon in MAC super-frame? Explain the data transmission protocols in wireless sensor network with necessary diagrams. (02+06)  
b) What are the practical congestion avoidance mechanisms in wireless sensor networks? Explain the CSMA/CD and CSMA/CA schemes. (02+06)  
c) Explain the hidden node and exposed node problems with their solutions. (10)  
d) Construct a super-frame for IEEE 802.15.4 MAC protocol. (09)

## SECTION B

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

5.
  - a) Provide basic structure of wireless mesh networks. (09)
  - b) How do you classify the network architecture of WMNs? (09)
  - c) What are the differences between WMN and Ad-hoc network? (08)
  - d) What are the advantages of multi-channel multi-transceiver MACs? (09)
  
6.
  - a) What do you mean by cross-layer design in layered protocol design? How can cross-layer design be classified? (10)
  - b) What are the main consideration points to design MAC and physical layers? (06)
  - c) How do you deal with mobility management in WMNs? (09)
  - d) Explain clearly the basic architecture of MAC handshaking for IEEE 802.11b. (10)
  
7.
  - a) What do you mean by transmission opportunity in IEEE 802.11e? Show the AIFS timing diagram in a backoff process. (14)
  - b) Construct a super-frame structure of IEEE 802.11e including "CP" and "CFP". (11)
  - c) What are the features of the standard IEEE 802.11n? Compare MSDU and MPDU aggregation. (10)
  
8.
  - a) What are the functions of cluster head in ad-hoc network? Explain the principle of CGSR. (03+05)
  - b) Explain the features of BAN. What are the purposes of BAN in our modern life? (04+04)
  - c) Compare the performances of GPRS and UMTS. (10)
  - d) Explain the challenges and technical requirements of BAN. (09)

**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY**

B.Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2017  
Department of Electronics and Communication Engineering  
ECE 4205

(Satellite Communication 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) Briefly explain a basic satellite system with necessary block diagram. (08)  
b) Why satellite communication is unique? Why upconversion is used after modulation in an earth station? (10)  
c) Why are the uplink and downlink frequencies different in satellite communications? (08)  
d) Define the following terms and show with diagrams: i) Apogee, ii) Ascending node, iii) Prograde, and iv) look angle. (09)
  
2. a) What is eclipse? Calculate the maximum daily eclipse duration for a satellite having radius of earth is 6378.155 km, distance of the satellite from earth centre is 42164.2 km and maximum inclination angle is 23.4°. (10)  
b) Describe the technique for 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) "Increasing the orbit radius, decreasing the velocity of satellite"-justify the statement. (10)  
b) Write down the basic requirements those an earth station antenna should meet. (06)  
c) Derive the expression of equivalent noise temperature of a cascade two port system. (12)  
d) Write down the significance of frequency agile up conversion process. (07)
  
4. a) Deduce the expression of carrier to noise ratio of a basic satellite link with necessary diagram. (13)  
b) What is VSAT? Describe VSAT network configurations with necessary diagrams. (10)  
c) A satellite orbiting at 38000 km transmit signal at 11.7 GHz, the output power of the satellite transmitter is 250 mW fed to an antenna of directive gain 18.9. The earth station antenna being 4 m dish with efficiency 60%. Find the G/T ratio of the earth station of bandwidth 36 MHz if C/N=40 dB. The value of  $k = -228.6 \text{ dBJ}^\circ\text{k}$ . (12)

## SECTION B

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

5. a) How is radar operated using single antenna? Explain with suitable figure. (5+4)  
b) Write down the reasons for failure of radar equation. (08)  
c) What is pre-detection integration and post-detection integration for calculating radar range? Why is post-detection integration preferred? (5+3)  
d) Define MTI radar. Draw the block diagram of MTI radar that uses a power amplifier as the transmitter. (10)
6. a) What is the false alarm and missed detection of a target? Why is the threshold level very important to set at a proper place for identifying the target signal? (12)  
b) What do you mean by delay line cancelers? Describe the frequency response of single delay line canceler. (4+6)  
c) What is flicker effect and how is it overcome? Explain with suitable diagram. (5+4)  
d) What are the limitations to determine the accuracy of tracking radar? (04)
7. a) What do you mean by sequential lobing tracker and simultaneous lobing tracker? Describe the angle tracking system for detecting the target. (5+5)  
b) Draw the block diagram of ASR-8 airport surveillance radar. (08)  
c) Draw the block diagram of conical scan tracking radar. (07)  
d) A radar system operates at 10 GHz with a common antenna with a gain of 30 dB. The receiver has a bandwidth of 1 kHz and the noise factor is 5 dB. The transmitted power is 1 kW and the target echoing area is  $10 \text{ m}^2$ . Calculate its range for  $S/N=10$ . (10)
8. a) What are the things should be considered for designing a new radar? (07)  
b) Why is electronically steerable phased array suitable for radar application? (09)  
c) Classify different types of mixer used in radar receiver and describe the image rejection receiver. (3+6)  
d) The average time between false alarms is specified as 30 min and the receiver bandwidth is 0.4 MHz. (10)  
i) What is the probability of false alarm?  
ii) What is the threshold to noise power ratio  $(V_T^2 / \psi_o)$ ?

**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY**  
**B.Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2017**  
**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) What do you mean by management? (05)  
 b) Discuss the functions of personnel management. (10)  
 c) State the principles of management. (10)  
 d) Differentiate between administration and management. (10)
2. a) Define wages. Discuss the various methods of payment of wages. (15)  
 b) State the objectives of manpower planning. (10)  
 c) Describe the importance of man power planning. (10)
3. a) What is meant by merit rating? (05)  
 b) State the features of merit rating. (10)  
 c) What are the objectives of merit rating? (10)  
 d) State the external sources of recruitment. (10)
4. a) State the marketing concepts. (10)  
 b) Discuss the functions of channel of distribution. (10)  
 c) What are the purposes of advertisement? (07)  
 d) Explain the basic steps in budgetary control. (08)

**SECTION B**

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

5. a) What is accounting equation? Describe the elements of accounting equation. (05)  
 b) Who are the users of accounting information? (05)  
 c) Mr. Zaman established Sundarban Travel Agency. The following transactions were completed during the month of January 2016: (25)

January -1	Invested Tk. 80,000.00 cash and 20,000.00 equipment to start the agency.
January -2	Paid Tk. 4,000.00 cash for January office-rent.
January -3	Purchased office equipment for Tk 5,000.00 cash.
January -4	Incurred Tk. 3,000.00 of advertising costs in the "Daily Ittefaq" on account.
January -5	Paid Tk. 6,000.00 cash for office supplies.
January -6	Earned Tk. 75,000.00 for services rendered: Tk. 10,000.00 cash is received from customers and the balance of Tk. 65,000.00 is billed to customers on account.
January -7	Withdraw Tk. 2,000.00 cash for personal use.
January -8	Paid Daily Ittefaq amount due in transaction (4).
January -9	Paid employees' salaries Tk. 22,000.00 in cash.
January-10	Received Tk. 50,000.00 in cash from customers who have previously been billed in transaction (6).
January-11	Service provided on account Tk. 6,000.00.
January-12	Cash received from client Tk. 6,000.00 transaction (11).

*Instructions:* prepare a tabular analysis of the transactions using the following column headings: Cash; Accounts receivable; Supplies; Office equipment; Accounts payable; Mr. Zaman, Capital.

6. a) What is accounting cycle? Describe the steps of accounting cycle. (10)  
 b) Digital IT center was started by Mr. Rafin in a small shopping center, in the first month of operation, he completed the following transactions: (25)

2015	Deposited Tk. 70,000.00 in an account in the name of the company to start the business.
January -1	Deposited Tk. 70,000.00 in an account in the name of the company to start the business.
January -2	Paid current month's rent Tk. 9,000.00.
January -3	Purchases store equipment on credit Tk. 36,000.00.
January -4	Purchased supplies for cash Tk. 17,000.00.

January -5	Received revenue Tk. 8,000.00 for service provided.
January -6	Billed customers for service provided Tk. 7,000.00.
January -7	Paid utility expense in cash Tk. 2,500.00.
January -8	Received payment from customers Tk. 2,000.00.
January -9	Made payment on store equipment purchased in transaction (3) Tk. 18,000.00.
January-10	Withdraw cash for personal expenses Tk. 4,000.00.

Required: Journalize the above transactions.

7. a) Distinguish between financial accounting and cost-accounting. (07)  
b) Show the classification of costs. (03)  
c) From the following information of ABC manufacturing company, prepare a cost sheet showing the items: (a) Cost of raw materials used; (b) Prime cost; (c) Works cost/Factory cost; (d) Production cost; (e) Total cost (f) Profit/loss account. (25)

S/ N		Taka	S/ N		Taka
1	Purchase of raw materials	66,000.00	12	Stock of finished goods 01-01-2016	52,000.00
2	Stock of raw materials 01-01-2016	45,000.00	13	Stock of finished goods 31-12-2016	55,000.00
3	Stock and raw materials 31-12-2016	48,000.00	14	Sales	2,28,000.00
4	Work in progress 01-01-2016	28,000.00	15	Factory rent and power	15,000.00
5	Work in progress 31-12-2016	32,000.00	16	Sundry factory expenses	10,000.00
6	Indirect wages	2,750.00	17	Repairs of factory building	5,100.00
7	Direct expenses	3,500.00	18	Office rent	4,200.00
8	Sundry office expenses	9,500.00	19	Advertisement	3,500.00
9	Salesman's salary and commission	6,500.00	20	Managers salary (office)	3,400.00
10	Carriage outwards	2,500.00	21	Electric charge (office)	800.00
11	Direct wages	55,000.00			

8. a) The following trial balance has been extracted from the books of Mr. Rana as at December 31, 2013 (35)

	Debit (Taka)	Credit (Taka)
Capital		30,000.00
Drawings	1,200.00	
Machinery	27,000.00	
Furniture	5,000.00	
Loan from Hannan		7,000.00
Accounts receivable	6,000.00	
Accounts payable		4,600.00
Stock goods 01-01-2013	4,000.00	
Sales		56,800.00
Purchased	30,000.00	
Purchase return		250.00
Sales return	400.00	
Salaries	20,500.00	
Carriage inward	1,500.00	
Rent expense	1,000.00	
Cash in hand	2,050.00	
<b>Total</b>	<b>98,650.00</b>	<b>98,650.00</b>

You are required to prepare statement of comprehensive income, statement of owners' equity and statement of financial position as on December 31, 2013. Considering the following adjustments:

- a) Closing stock at December 31, 2013 Tk. 5,000.00  
b) Salaries outstanding Tk. 500.00  
c) Maintain as allowance for bad debts Tk. 250.00  
d) Depreciation on machinery by 5% and furniture by 10% per annum.

**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY**

B.Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2017  
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 switching system of a telecommunication network. (08)  
b) Mention the four types of connections that may be established through a switching network. (10)  
c) Draw and explain the central battery (CB) exchange system that operated by a human being. (09)  
d) Describe the signaling tones in automatic exchanges with necessary diagrams. (08)
2. a) Define the following terms: (10)  
i) Homing circuit, ii) Cost capacity index, iii) NOSFER system, and iv) Tandem exchange.  
b) Mention the Rotary dial telephone parts and mechanism for implementing the pulse dialing. (08)  
c) Discuss in brief the selector hunter and line finder based subscriber access system for Strowger switching system. (10)  
d) Draw the functional block diagram of a common control switching system (07)
3. a) What are the fundamental features of a common control system? (07)  
b) What are the advantages of using band separation technique to improve protection against talk-off? (08)  
c) Discuss in brief the 6×6 crossbar switching. Also, mention the advantages of using diagonal cross-point switching. (10)  
d) What are the limits to increase the length of subscriber loop system? Also, discuss the techniques that can be applied to overcome the aforementioned constraints. (10)
4. a) Prove that the unavailability of dual processor system is given by  $U_D = \frac{2(MTTR)^2}{(MTBF)^2}$ , (10)  
where the symbols have their usual meanings.  
b) Explain the protocol architecture of SS7. What is the relationship between SS7 and ISO-OSI model? (10)  
c) Describe the principle of time slot interchange technique for time multiplexed time switching. (08)  
d) 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. (07)

## SECTION B

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

5. a) Derive the expression of force experienced by the diaphragm of an earphone. What is the dependency of this force with the microphonic signals? (13)
- b) What is the significance of sidetone? Explain the mechanism for handling this sidetone with a proper circuit diagram. (12)
- c) Explain an optical communication system with appropriate diagram. (10)
6. a) What is crosstalk? Describe different types of crosstalk. (09)
- b) An exchange uses a -40 V battery to drive subscriber lines. A 250 ohm resistance is placed in series with the battery to protect it from short circuit. The subscriber's telephone set offers a 50 ohm dc resistance. The microphone requires 23 mA for proper functioning. Determine the farthest distance of subscriber from the exchange if 26 AWG conductor is used. Note that the specifications of 26 AWG are: Diameter (mm): 0.41; dc resistance (ohm/km): 133.89; Attenuation (dB/km): 1.61. (10)
- c) Briefly discuss the terms "pure-chance traffic" and "statistical equilibrium". (07)
- 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)
7. a) Draw the functional block diagram of a standard telephone set. (07)
- b) Interpret the following hex code for a caller ID message (start and stop bits are not included in the hex code) (12)
- 04 09 30 39 33 30 31 32 33 34 50 12
- c) Illustrate the commanding process with neat sketch. (10)
- d) Mention the differences between DTMF and MF. (06)
8. a) Define queuing system. (05)
- b) For a lost call system, deduce the expression for the first Erlang distribution and hence the grade of service. (10)
- c) 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: (10)
- i) The traffic offered, ii) traffic carried, iii) the traffic lost, iv) the grade of service, and v) the total duration of the periods of congestion.
- d) A group of 20 trunks provides a grade of service of 0.01 when offered 12 E of traffic. (10)
- i) How much is the grade of service improved if one extra trunk is added to the group? and 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, 2017

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) What is meant by Biomedical Engineering? Briefly explain the scopes of Biomedical Engineering and discuss on the roles of Electronics and Communication Engineers for them. (11)  
b) Describe the mechanisms behind the generation of membrane potentials in living cells. Calculate the equilibrium resting potential of muscle tissue at 37°C for the following K<sup>+</sup> ion concentrations: (12)  
Intracellular concentration, [K<sup>+</sup>]<sub>i</sub> = 150 millimoles/liter  
Extracellular concentration, [K<sup>+</sup>]<sub>o</sub> = 4 millimoles/liter.  
c) Explain the working principle of a typical modern electrocardiograph system using suitable block diagram. (12)
2. a) Define electrode and half-cell potential. Explain the influence of current flow through electrode on the half-cell potential. (11)  
b) Why is the isolation necessary in medical instrumentation? Describe the working principle of a capacitive coupled isolation amplifier and mention its advantages and application areas. (11)  
c) Compare different bio-signals in terms of their voltage and frequency ranges. (06)  
d) Write down the significance of Alpha rhythm in EEG. (04)  
e) Show the effects of varying light stimulus on ERG. (03)
3. a) Write short notes on: (i) Ultrasound beam formation process (12)  
(ii) Photo-thermal therapy.  
b) What is the frequency range of X-ray? Describe the radiation phenomena behind the production of X-ray using suitable diagrams. (14)  
c) Explain the Doppler based blood velocity estimation technique using ultrasound and LASER. (09)
4. a) List the different components of modern CT system. Explain the CT image formation procedure from the X-ray projection images. (11)  
b) Briefly explain the principle of magnetic-resonance imaging (MRI) technique. (15)  
c) Define prosthetics with illustrative examples. As an Electronics and Communication Engineer, how can a professional contribute in functional improvement of prosthetic organ? (09)

## SECTION B

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

5.
  - a) What is patient monitoring system? Why is it required? Where it is required? (08)
  - b) What is pulse oximetry? Explain the operation of a pulse oximeter using the diagrams of internal circuitry. (12)
  - c) Describe the bed side monitor circuit with suitable diagram. (15)
  
6.
  - a) What is surgical diathermy? Describe the electrode that used in surgical diathermy. (15)
  - b) Describe the fabrication process of microchip for drug delivering system. (15)
  - c) Why the gold membrane used in microchip for drug delivery system? (05)
  
7.
  - a) Describe the electrode system of pacemaker device. (10)
  - b) What is defibrillator? Design a capacitive discharge defibrillator for the following specifications:  
 $R_{\text{chest}}=95\Omega$ ,  $R_{\text{lead}}=5\Omega$ , total energy stored in capacitor(C) is 300J, and 90% energy delivered to heart by 8 ms. (13)
  - c) Describe the class and types of medical electrical equipment. (12)
  
8.
  - a) Write short-notes on (i) Gross shock; (ii) Micro shock and (iii) Macro Shock. (12)
  - b) What is biosensor? What are the desired features of biosensor? Explain. (08)
  - c) What are the effects of bioinstrumentation design? (09)
  - d) Mention some signal converter of biosensor. (06)