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 components of a sensor node? Explain the typical architecture of a sensor node. (08)
    b) Explain the concept of smart home and precision agriculture. (08)
    c) What are the advantages of multi-hop sensor network? Calculate the effective number of hops to transmit data from a source to sink which is 120 m apart. (08)
    d) What is quality of service in wireless sensor network? Explain the energy efficiency in wireless sensor network. (05+06)

2. a) What do you mean by scalability? With necessary diagram explain the conditions of coverage and connectivity between two sensor nodes. (03+04)
    b) Explain important synchronization problems of wireless sensor network. (12)
    c) Classify localization methods. Explain different methods in brief. (06)
    d) List different network congestion avoidance mechanisms. What are the conditions for a secure sensor network? (10)

3. a) What are the states of a node to consume energy in wireless sensor network? What is crossover distance? (04+02)
    b) Assume the crossover distance is 40 m, 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. (15)

Fig. for Q.3 (b).
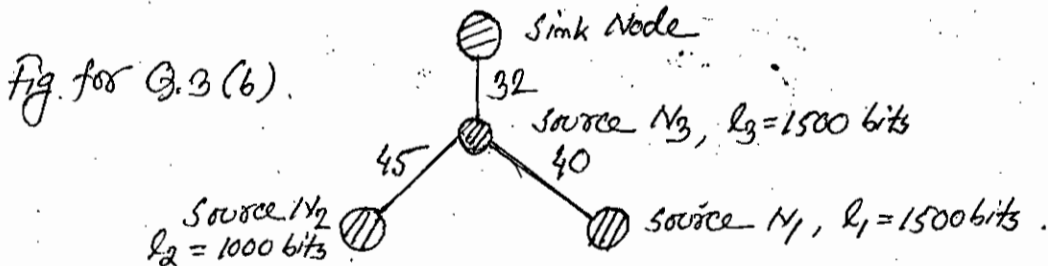
    c) A node transmits a packet of length 1500 bits to a neighbor. Calculate the number of retransmission if the BER is 10^{-4}. (08)
    d) Why routing is required in wireless sensor network? Complete the following routing table for the source node C of Fig. 3(d) (02+04)

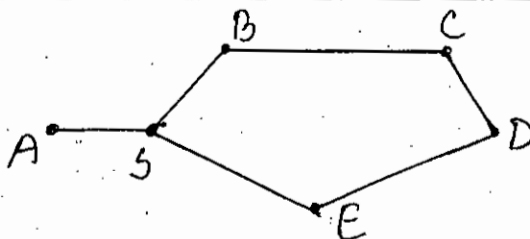| Destination	Next-hop Neighbor	Cost
A	D	
A	B	
E	B	
E	D	

Fig. 3(d)

4. a) What is implosion and resource blindness? Calculate the number of duplicate packets received at the sink node for flooding protocol of network shown in Fig. 4(a). Here all the sources generate same packets of P. (02+06)
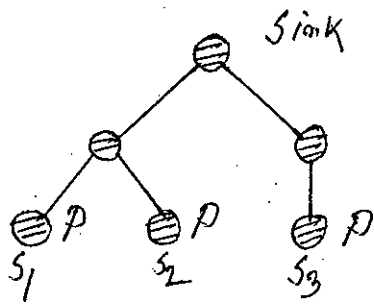
Fig. for 4(a)

b) Construct a superframe for IEEE 802.15.4 MAC protocol. (10)

c) What are the comparisons between S-MAC and Adaptive S-MAC. (10)

d) What are the attacks in wireless sensor network? Explain the security challenges of WSN. (03+04)

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

5. a) What are the differences between conventional radio node and WMN node? (10)

b) What do you mean by scalable multi-channel MAC protocol? What is the principle of multi-channel multi-transceiver MAC protocol? (15)

c) What are the differences between WMN and Ad-hoc networking in terms of routing and mobility? (10)

6. a) Why SPIN-2 is better protocol than SPIN? (08)

b) What is WPAN? Explain the IEEE standard of WPAN. (11)

c) Distinguish between DCF and PCF superframe in IEEE 802.11b (10)

d) Show the MAC handshaking for IEEE 802.11b (06)

7. a) Show the timing diagram of MPDU transmission and network allocation vector (NAU). (10)

b) Why IEEE 802.11e proposes a new access scheme? What is the function of a hybrid coordinator? (10)

c) What are the goals of IEEE 802.11n/ac working group? (07)

d) Explain the basic architecture of Bluetooth system. (08)

8. a) What are the important features and technological requirements of body area network (BAN)? (08)

b) What are the design challenges for underwater sensor networks w.r.t terrestrial sensor networks? (07)

c) Show the internal organization of an underwater sensor node. (08)

d) Discuss about the Urick Propagation model for deep water. (12)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering 4th Year 2nd Term Examination, 2016
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) Draw the functional block diagram of a digital earth station and briefly describe its operation procedure.   (06+06)
   b) Why are the uplink and downlink frequencies different in satellite communication?   (08)
   c) Deduce the expression of slant range for a communicating satellite. Briefly explain the importance of slant range in satellite communication.   (07+03)
   d) State Kepler's second law.   (05)

2. a) Briefly explain the methods used to achieve stability of satellite in orbit.   (08)
   b) What are the different types of satellite orbits? Briefly discuss their merits and demerits.   (03+06)
   c) What is an eclipse? Find the maximum delay eclipse duration and total duration of eclipse to and from the equinox.   (08)
   d) If a satellite is at a height of 36000 km and orbiting in equatorial plane, comment whether the satellite will be under eclipse on equinox days or not. If yes, then find the duration of eclipse.   (05+05)

3. a) Write down the requirements those an earth station antenna must meet.   (05)
   b) Describe the effect of rain attenuation on system noise temperature.   (07)
   c) Describe upconversion process with necessary diagrams. Write down the significance of frequency agile upconversion.   (06+02)
   d) For the receive side of an earth station, find the system noise temperature referred to the input of the low noise amplifier using the following parameters: (15)
   Antenna gain: 52.6 dB,
   Waveguide loss: 0.1 dB,
   Low noise amplifier gain: 55 dB
   Equivalent noise temperature : 40 K
   Downconverter equivalent noise temperature : 213600 K
   Ambient temperature: 300 K
   Antenna noise temperature contributors-
   Main beam: 25.6 K
   Subreflector spillover : 3.3 K
   Main reflector spillover : 0.7 K
   Blockage : 9.8 K
   Surface tolerance : 1.5 K
   Feed loss: 13.9 K

4. a) Derive the equation for carrier to noise plus interference ratio for a satellite link. From the equation, give your comments about noise dominant link.   (09)
   b) Figure 4(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.   (09)

$$\text{Antenna } T_A \quad \text{Waveguide } L_1, T_{e1} \quad \text{Low-noise amplifier } G_2, T_{e2} \quad \text{Downconverter } T_{e3}$$

T

Figure 4(b)

c) What is VSAT? Describe VAST network configurations with necessary diagrams. (03+05)
d) An earth station transmits at 5.62 GHz from an antenna of 6m. The transmitter generates (09)
an output of 8kW. The satellite is 39920 km from the earth station. The efficiency of
transmitting antenna is 0.7. Calculate (i) Path loss, (ii) Transmitting antenna gain, (iii)
Transmitter power in dB, (iv) EIRP and (v) Received power at the satellite.

SECTION B

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

5. a) What do you mean by unambiguous range? Write down the applications of radar. (04+04)

b) What do you mean by thermal noise? Find out the value of object's distance in respect of (03+07)
receiver noise.

c) What are the limitations of simple CW radar and can it be overcome? (05+05)

d) Calculate the maximum range of a radar system which operates at 3cm with a peak pulse (07)
power of 500 kw, if it's minimum receivable power is 10^{-13} w, the capture area of it's
antenna is 5 m^2 and the radar cross sectional area of the target is 20 m^2.

6. a) What do you mean by false alarm and missed detection for a target? Why is threshold level (04+04)
very important to set at a proper place for identifying the target signal?

b) What is radar cross section? Describe all regions of radar cross section. (03+04)

c) Describe the blind speed with suitable equation. What are the techniques for reducing the (10)
blind speed?

d) A ground based air-surveillance radar operates at a frequency of 1300MHz (L-band). Its (10)
maximum range is 200 nmi for the detection of a target with a radar cross section of one
square meter ($\sigma=1m^2$). Its antenna is 12m wide by 4m high and the antenna aperture
efficiency is $\rho_a =0.65$. The receiver minimum detectable signal is $S_{min}=10^{-13}$W. Determine
the followings:
    (i) Antenna effective aperture, A_e and antenna gain G.
    (ii) Peak transmitter power
    (iii) Pulse repetition frequency to achieve a maximum unambiguous range of 200
    nmi
    (iv) Average transmitter power, if the pulse width is 2 µs.

7. a) Why do you choose multiple pulse instead of single pulse for measuring the angle? (08)

b) Draw the block diagram of two co-ordinate amplitude comparison monopulse tracking (10)
radar.

c) What is simultaneous lobbing tracker? Why multiple pulses are usually employed in (08)
monopulse tracking radar?

d) Describe the important properties of HF-OTH radar. (09)

8. a) Write down the least five important differences between two air traffic control radar (10)
ARSR-3 and ASR-8.

b) Give the names of different types of mixer used in radar and describe image rejection (04+06)
mixer.

c) Write down the names of different types of display used in radar and describe PPI and RHI (04+06)
display.

d) What are the functions of range gate in conical scan radar? (05)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 3rd Year 1st Term Examination, 2016
Department of Electronics and Communication Engineering
Hum 3109
(Industrial Management & Accounting)

TIME: 3 hours   ~~এক্সাম ঢুঁ, Hum-4209~~   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 principles of management? (05)
   b) State the different types of organizational structure. (10)
   c) Discuss the advantages of centralization. (10)
   d) Describe the disadvantages of decentralization (10)

2. a) What do you mean by leadership? (05)
   b) Discuss the nature of leadership. (10)
   c) State the importance of leadership. (10)
   d) What are the qualities of a good leader? (10)

3. a) What is meant 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) What do you understand by advertising? (05)
   b) What are the purposes of advertising? (10)
   c) What do you mean by budget? Discuss the importance of budget. (12)
   d) Mention the benefits of training. (08)

SECTION B

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

5. a) Define accounting. Discuss the functions of accounting. (10)
   b) State the elements of accounting equation. (10)
   c) Mr. Qazi is an advocate having registration with Dhaka Bar council. He starts a sole (15)
      proprietorship law firm in the name of Qazi law services. During the first month of
      operation, March 2013, Qazi engages in the following transactions:
      March-1 Qazi invested Tk. 100,000 of personal cash to begin the office.
      „ 2 purchased furniture paying Tk. 40,000 in cash.
      „ 3 purchase office supplies on account at a cost of Tk. 850.
      „ 4 deals a case for one client and received cash of Tk. 5,000.
      „ 5 pay Tk. 850 on the account payable (transaction 4).
      „ 6 paid in cash for electricity bill Tk. 400.
      „ 7 Qazi withdrawn cash of Tk. 1,500 for personal use.
      „ 8 salary paid in cash Tk. 5,000.
      Required: Journalize the above transactions.

6. a) Define Ledger. Discuss the objectives of Ledger. (10)
   b) What are the errors not detected by a Trial Balance? (05)

c) From the following information of Parjaton river resort, prepare a Trial Balance as on (20)
31st December, 2015.

	Taka		Taka
Cash	19,600	Account receivable	800
Supplies	900	Prepaid insurance	4,800
Cottage	1,50,000	Accumulated depreciation–cottage	900
Furniture	26,000	Accumulated depreciation –furniture	600
Accounts payable	6,500	Unearned rent	3,300
Salaries payable	400	Mortgage payable	80,000
Capital	100,000	Drawing	5,000
Depreciation expense–cottage	900	Depreciation expense –furniture	600
Rent revenue	84,900	Repair expense	3,600
Supplies expense	2,400	Interest expense	600
Insurance expense	1,200	Salaries expense	51,400
Utilities expense	9,400		

7. a) Define cost accounting. Show the differences between financial accounting and cost (10)
accounting.

b) From the following particulars of Dhaka Ltd. Prepare a cost sheet and show the profit (25)
for the period:

	Taka
Raw materials used	34,000
Work-in-progress (01-03-2015)	5,200
Work-in-progress (31-03-2015)	6,500
Finished goods (01-03-2015)	13,500
Finished goods (31-03-2015)	8,500
Direct wages 14,000 hours @ Tk. 10 per hour	
Direct expenses	7,200
Factory supplies	4,200
Indirect labour	9,000
Miscellaneous factory expenses	7,000
Administrative expense	15,000
Selling expenses	10,000
Profit 15% on sales	

8. On December 31, 2015 the Trial Balance of Tanvir and company is as follows: (35)

Account Titles	Debit (Tk)	Credit (Tk)
Sales		1,65,000
Sales revenue	5,000	
Purchases	80,000	
Carriage in	4,000	
Stock (01-01-2015)	10,000	
Wages	20,000	
Administrative expenses	25,000	
Insurance	3,000	
Selling and distribution expenses	10,000	
Purchase return		2,500
Drawings	10,000	
Capital		1,50,000
Furniture	1,20,000	
Equipment	20,000	
Accounts receivable	15,000	
Accounts payable		10,000
Cash	7,000	
Allowance for bad debts		1,500
Tk.	3,29,000	3,29,000

Adjustments: (i) prepaid wages Tk. 1,000, (ii) Unpaid administrative expenses Tk. 2,000, (iii)
Equipment is depreciated by Tk. 4,000, (iv) Ending stock at 31-12 -2015, Tk. 8,000, and (v) Bad debts
is to be written off Tk. 2,000.
Required: (a) prepare a comprehensive income for the year ended 31st December, 2015, (b) Prepare
owner's equity statement, and (c) Balance sheet as on 31st December, 2015.

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 4th Year 2nd Term Examination, 2016
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) Describe in brief the different elements of a switching system. Also, draw the switching network configurations. (10)
   b) State step-by-step switching technique to establish a connection for the number 4312. (10)
   c) Mention five subscriber related signaling functions as performed by the operator. (05)
   d) What are the strowger switching components? Draw and explain in brief. (10)

2. a) Draw the functional block diagram of a common control switching system. (07)
   b) Explain in brief the "band separation" and "choice of power levels" techniques for protection against talk-off in touch tone signaling system. (10)
   c) Differentiate between time-multiplexed time switching (TMTS) and time-multiplexed space switching (TMSS). (08)
   d) Describe parallel-in/parallel-out time switch for time multiplexed time switching system. Use necessary figures for your illustration. (10)

3. a) Describe the cable hierarchy for subscriber loop system. (06)
   b) Define the following terms: i) Right-through routing ii) Computer controlled routing. iii) Echo suppressor. (09)
   c) Given the following REs, determine the RE of a local call circuit. (10)
         For the telephone set: TRE=3 dB, RRE= - 3dB.
         For the subscriber line loop: TRE=10 dB, PRE= 8 dB.
         For the exchange switch: RE= 1 dB.
      What are the methods used to meet the resistance & attenuation constraints of a system when setting up a new exchange is not possible?
   d) In a national transmission system, the characteristics impedances of a 4-wire circuit and the 2-wire circuit are 1000 Ω and 1200 Ω respectively. The average phase velocity of the signal in the circuit is 3×10^7 m/s. If the largest distance of a connection is 300 Km, determine the attenuation to be inserted in the circuit. (10)

4. a) Explain the protocol architecture of SS7. What is the relationship between SS7 and ISO-OSI model? (12)
   b) What are the motivations of ISDN? Mention the services associated with the ISDN. (10)
   c) 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. (13)

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

5. a) "The total number of links L with n entities is given by n(n-1)/2 with p-2-p links"- Justify the statement. Is this expression or proposition is valid for large group of entities? Explain your comments with fully connected networks. (10)
   b) What is the importance of a steady current flowing through a carbon microphone? Is the harmonic distortion affected by a change in the energizing current? (08)
   c) What is the significance of sidetone? Explain the mechanism for handling this sidetone with proper circuit diagram. (10)
   d) Differentiate between simplex, half duplex and full duplex communication. (07)

6. a) Draw the functional block diagram of a standard telephone set and explain it briefly. (08)
   b) What is meant by congestion? During the busy hour, calls were offered to a group of (10)

trunks within an exchange for cheap trunks. The average duration of call was 3 minutes. Find, No. of calls 1500 and No. of lost calls 200. Find .
i) The traffic offered. ii) The traffic carried, iii) The traffic lost iv) The grade of service (GoD), iv) Total periods of congestion.

c) Why does crosstalk occur in a communication channel? Discuss the types of crosstalk that can be induced in a system. (07)

d) Interpret the following hex code for a caller ID message (start and stop bits are not mentioned in the hex code): (10)
04 12 30 39 33 30 31 32 32 34 36 30 39 35 35 35 31 31 33 34 51

7. a) Briefly explain the 5-level switching hierarchy with necessary diagram. (10)

b) Draw the block diagram of PCM system with analog companding and explain its operation. (06)

c) How much does the SQR of a uniform PCM encoder improve when one bit is added to the codeword. (06)

d) For a compressor with $\mu=255$, determine (13)
i) the voltage gain for the following relative values of V_{in} :
    Vmax, 0.75 Vmax, 0.5 Vmax, and 0.25 Vmax
ii) The compressed output voltage for a maximum input voltage of 4V
iii) Input and output dynamic range and compression.

8. a) Over a 'X' minute observation interval, Y subscribers initiate calls. Total duration of the calls is 4800 seconds. Calculate the load offered to the network by the subscribers and the average subscriber traffic. (07)

b) Define the following terms: i) 1 Erlag ii) BHCA and CCR. (07)

c) For a queuing system, show that $p(x) = \dfrac{N^N}{N!}\left(\dfrac{A}{N}\right)^x p(0)$, where symbols have their own meanings for telecommunication traffic theory. (11)

d) A group of four trunks is offered 2E of traffic. Find: (10)
i) The grade of service.
ii) The probability that only one trunk is busy.
iii) The probability that only one trunk is free.
iv) The probability that at least one trunk is free.

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 4th Year 2nd Term Examination, 2016
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 factors are needed to consider in designing medical instruments? Describe the design process of typical medical instruments. (12)
   b) Draw the action potential characteristics of different excitable cells. How does action potential propagate through a cardiac cycle? Explain using necessary diagrams. (12)
   c) How is the muscle activated by brain signal to execute specific task? Explain the estimation procedures of muscle activities from EMG signal using necessary diagrams. (11)

2. a) What are the basic requirements of biopotential amplifiers? Design an ECG amplifier circuit. (13)
   b) Draw the circuit diagrams of different isolation amplifiers and explain them. (15)
   c) Draw and briefly explain the equivalent circuit of an electrode placed on the skin surface along with a reference electrode. (07)

3. a) What are the advantages and disadvantages of optical imaging? Explain the interactions between light and tissue and mention their significance in medical diagnosis. (10)
   b) What is the range of ultrasound frequency for medical uses? Describe the ultrasound beam and image formation techniques. (15)
   c) Define CT and CT number. Explain the reconstruction procedures of CT image using necessary diagrams. (10)

4. a) What is MRI? "Human body is full of tiny magnets"- justify the statement. (07)
   b) Why are the RF excitation and magnetic field gradients necessary in MR imaging? Explain using necessary diagrams. (10)
   c) What is prosthetics? What factors are needed to consider in selection and development of prosthetic biomaterials? (08)
   d) Explain the working principle of an intelligent multifunctional prosthetic arm using necessary diagram. (10)

SECTION B

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

5. a) Briefly describe the construction and operation of x-ray tube. (15)
   b) What are the most important features of x-ray machines? Draw the block diagram of x-ray machine. (10)
   c) Draw and explain the block diagram of a bedside patient monitoring system. (10)

Page: 1 of 2

6. a) Define and classify biosensors. Also describe the performance specifications of biosensors. (13)

   b) Describe the biomeasurement system using biosensors to measure a biological signal. (10)

   c) What is biological signal? How to classify of biological signals? (05)

   d) Explain the basic components of biosensors using necessary diagrams. (07)

7. a) What is defibrillation? Discuss the strength duration curve of defibrillation. (09)

   b) What is cardioversion? Draw the block diagram of cardioverter. (08)

   c) Figure 7(c) shows capacitive discharge defibrillator circuit, where given some parameters value such as $R_{chest}=95\Omega$, $R_{lead}=5\Omega$, total energy stored in C is W=300J, want to deliver 90% of W to heart in 8 ms. What value of C should be used? (10)
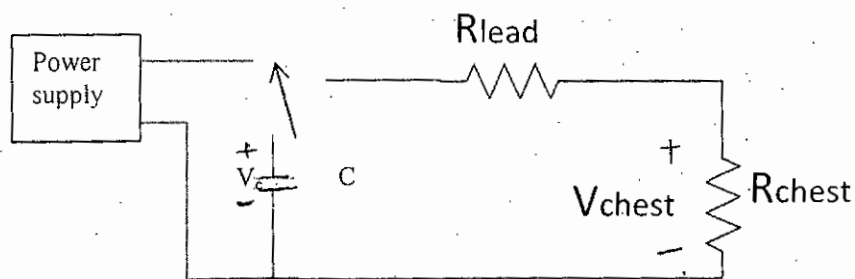

Figure 7(c)

   d) Describe the operations of square wave defibrillatiors in brief. (08)

8. a) What is pacemaker? What are the needs for pacemaker? (06)

   b) What are the basic requirements of implantable cardiac pacemakers? (07)

   c) Why do we use electrical safety? Discuss the electrical shock hazard in medical equipments? (10)

   d) Explain the effects of electric current on human body. (12)