شبكات المعلومات - ٤ إنصالات - ٢٠١٦/١/١١

بسم الله الرحمن الرحيم

كلية الهندسة بحلوان

Dept/Division : **Electronics, Communications & Computer Engineering**
Academic level: **B.Sc., Communications** Semester: ***First*** **2015/16**
Course code & title: **(ELC 8422)** **Information Networks**
Instructors: **Prof. Gamal Abdel Fadeel,**
Dr. Mahmoud El Mesallawy
Total mark: **90 mark** Time allowed: **3 Hrs**

Instructions: ***Exam Consists of TWO Parts, Attempt ALL,***

PART: ONE *(45 mark)* *ALL Answers must be* ***in ONE, Contiguous part***

Question 1**.....** ***(12mark)***

Consider the IP-sec. protocol. ***a)*** **Using a sketch, compare** between the authentication header **and** the encapsulated security payload schemes. ***b)*** **Suggest** a **tunneling** scheme that can provide authentication + privacy (sketch). ***c)*** **Give** an **example** to show what MAC is used for.

Question 2., ... ***.....(12 Mark))***

(a)- Why HDLC protocol is NOT used for the ***dial up*** (point to point) connections, sketch **frame** of the protocol being used instead.

(b)- Choose a **safe** protocol for dial up access **security**, and explain its actions.

(c)- What is the **protocol** used to EXTEND the dial up connections to **access** the **internet** (sketch its frame and show its properties).

(d)- Detail **spectrum** of **DSL** lines.

Question 3**.....** ***(9 marks)***

a) Given the IP address, 192.168.10.X, **Design** an IP-addressing to provide for: 7-subnets, 28-user per subnet.
b) Find the broadcasting address for **each** subnet in part **a)**
c) Define **types** (classes) of IP-**ver. 6** addressing.

Question 4**.....** ***(12 mark)***

a- **Give** example showing label **stacking** (nesting) in **the MPLS** technology (details).
b- Compare between the two **layer-4** protocols, sketch.
c- What are the service classes defined in ATM technology?
d- Detail characteristics and possible applications of each of the **radio** transmission **bands** defined by the **ITU**.

و دائما ... إليكم جميعا ... نهدى ... أجمل الأماني.

من فضلك اقلب الورقه (الجزء الثانى)

PART TWO (45 Marks): *ALL Answers must be* ***in ONE, Continuous part***

Question 5: [17 Marks]

a) **What** is vulnerable period? **How** it affects the performance of MAC protocols?

b) **Explain** distance vector routing technology. **What** are its limitations and **how** are they overcome?

c) **Differentiate** between classful and classless routing protocols.

d) **State** the differences between CSMA/CD and CSMA/CA.

e) Assume that there are only two stations, A and B, in a CSMA/CD network. The distance between the two stations is 2000m and the propagation speed is $2x10^8$ m/s. If station A starts transmission at time t1:

i. **Does** the protocol allow station B to start transmitting at time t1+ 8μs? If the answer is yes, **what** will happen? **Justify** your answer.

ii. **Does** the protocol allow station B to start transmitting at time t1+ 11μs? If the answer is yes, **what** will happen? **Justify** your answer.

Question 6: [28 Marks]

For two autonomous systems network topology shown in Figure 1, answer the following questions:

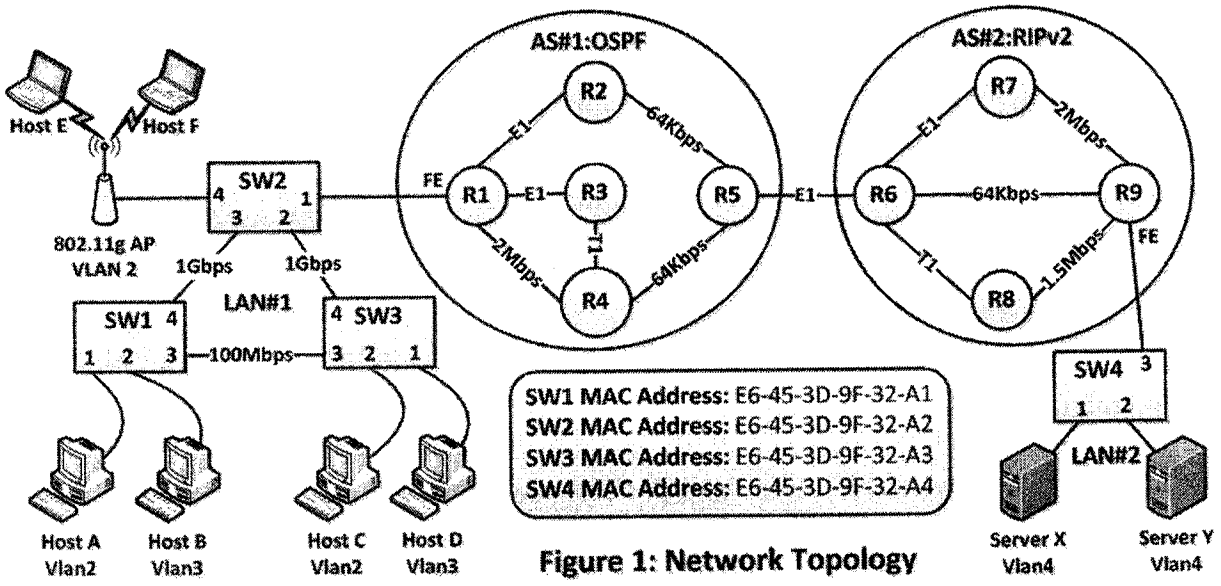


Figure 1: Network Topology

a) **How many** numbers of collision and broadcast domains? **Justify** your answer.

b) If IEEE802.1w is enabled on all switches of LAN#1, **determine** the spanning tree and **define** the state of each port in the three switches.

c) **Write** the switching table for SW1. (Represent the MAC address by the name of each item).

d) **Explain** the encoding scheme used by the 1Gbps-link between SW1 and SW2, if it was implemented using 1000Base-T.

e) **Define** the multiple access technique, modulation technique, and data rates used by Host F.

f) If network address 140.10.0.0/24 is used, **assign** an IP address for each host, server, and router interface.

g) **Write** the routing table for R1 and R6, **showing** the parent, child, and ultimate routes.

h) **What** is the route (path) followed by the data packets sent from Host A to Server X.

Good Luck

٢٠١٥/١/١٤ - ٤ انصارت - نظم المعلومات والترميز

كلية الهندسة بحلوان

Dept.: Electronics, Communications and Computer Engineering
Division: Electronics and Communications
Academic level: Fourth
Course Code/Title: ELC 8411/Information Theory & Coding
Instructors: Prof.\ A. H. El-Sawy, Assoc. Prof.\ Maged H. Ibrahim, Dr.\ S. Gaber
Final Exam, First term, Fall 2015, **Time allowed:** 3 hours, **Total Marks:** 100

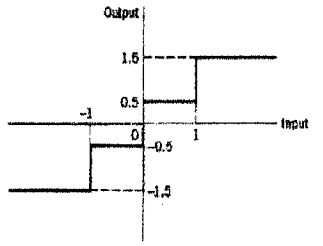
Answer all the following questions:

PART ONE (50 Marks)

Question One (16 Marks)

A Gaussian signal of mean value ($\mu = 0.5$) and a standard deviation ($\sigma = 2$), is bandlimited to 10kHz and sampled at the Nyquist rate. The samples are input to a four-level quantizer having the input-output amplitude characteristics shown. Each quantum level represents one symbol as follows:

s_1: [0.5] s_2: [1.5] s_3: [-0.5] s_4: [-1.5]



Assuming a binary encoder radix ($r = 2$), satisfy the following:

A	Find the symbols probabilities and the system Entropy. (Q-function table attached)
B	Design a Shannon-Fano code for the above quantizer then compute: (i) The information rate, (ii) the encoder output bit rate.

Question Two (18 Marks)

A second-order Markov Source $M = \{s_1, s_2\}$ has the transition matrix shown. The encoder radix is $r = 2$. Satisfy the following:

$$T = \begin{bmatrix} 0.5 & 0.5 \\ 0.7 & 0.3 \\ 0.8 & 0.2 \\ 0.1 & 0.9 \end{bmatrix}$$

A	Draw the state diagram and find the equilibrium state probabilities of the system.
B	Design an instantaneous code for the above system and compute its efficiency.
C	Design a Huffman code for the 2nd extension. Show whether or not the efficiency is improved.
D	Using the code in (C), encode the stream: ($s_1s_2s_2s_1s_1s_2$) assuming an initial state s_1s_1.

Question Three (16 Marks)

A Prove that, for a zero-mean Gaussian signal of bandwidth W and Power P, AWGN of power spectral density N_o, the channel capacity is of the form,

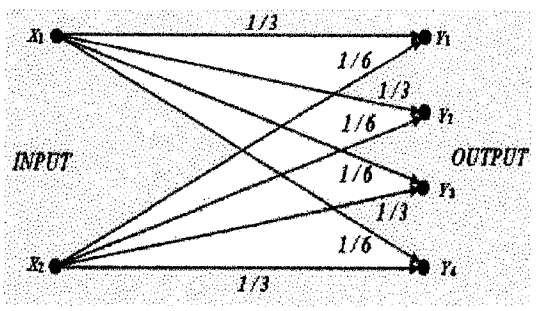
$$C = W.\log(1 + \frac{P}{WN_o}) \text{ bits per second}$$

B An information channel has the forward channel diagram shown. The input probabilities, $p(X_1)=1/4$ and $p(X_2)=3/4$. Satisfy the following:

i. Design a receiver decision rule and compute the average probability of error for the channel using the **Ideal Observer criteria**.

ii. Compute the system average uncertainty and the average mutual information.

iii. What is the uncertainty of the receiver after receiving Y_2?



Forward channel diagram

End of Part One – Please turn over for Part Two →

PART TWO (50 Marks)

Question Four **(20 Marks)**

A Consider $g(X) = 1 + X + X^3$ be the generator polynomial of a linear cyclic code of length 7.

i	Find the burst-error detection capability and the parity check polynomial $h(x)$.
ii	Encode the following message polynomial $u(X) = 1 + X + X^2$
iii	Decode the received polynomial $r(X) = 1 + X^3 + X^6$ using the Meggitt decoder.

B A turbo code encoder is formed using the parallel concatenation scheme. The two convolutional encoders have the transfer function matrices $G_1(D)$ and $G_2(D)$ as shown. The two encoders have constraint length $K = 3$. The interleaver scheme is the row-column interleaver. The input information is x as shown.

$$G_1(D) = \left[1 \quad \frac{1+D^2}{1+D+D^2}\right]$$

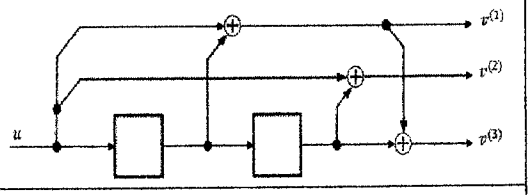
$$G_2(D) = \left[\frac{1+D^2}{1+D+D^2}\right]$$

$$x = \begin{bmatrix} x_1 & x_2 & x_3 \\ x_4 & x_5 & x_6 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$

i	Draw the turbo code encoder block diagram.
ii	Find the output of the interleaver for the input x.

Question Five **(30 Marks)**

Consider the rate $R = 1/3$ convolutional encoder illustrated in the figure.



A	Find the transfer function matrix $G(D)$ and the generator matrix.
B	Find the codeword corresponding to the input $u = (11101)$.
C	Draw the state-transition diagram. Show your work.
D	Draw the trellis diagram for an information with length L=5.
E	Decode the received sequence, r = (110,110,110,111,010,101,101), using Viterbi algorithm.

----------End of Exam, May God be with you----------

Given Table: Q – function: $Q(A) = \int_A^\infty \frac{1}{\sqrt{2\pi}} e^{\frac{-x^2}{2}} dx$, $Q(A) = 1 - Q(-A)$

TABLE OF THE Q FUNCTION

0	5.000000e-01	2.4	8.197534e-03	4.8	7.933274e-07
0.1	4.601722e-01	2.5	6.209665e-03	4.9	4.791830e-07
0.2	4.207403e-01	2.6	4.661189e-03	5.0	2.866516e-07
0.3	3.820886e-01	2.7	3.466973e-03	5.1	1.698268e-07
0.4	3.445783e-01	2.8	2.555131e-03	5.2	9.964437e-06
0.5	3.085375e-01	2.9	1.865812e-03	5.3	5.790128e-08
0.6	2.742531e-01	3.0	1.349898e-03	5.4	3.332043e-08
0.7	2.419637e-01	3.1	9.676035e-04	5.5	1.898956e-08
0.8	2.118554e-01	3.2	6.871378e-04	5.6	1.071760e-08
0.9	1.840601e-01	3.3	4.834242e-04	5.7	5.990378e-09
1.0	1.586553e-01	3.4	3.369291e-04	5.8	3.315742e-09
1.1	1.356661e-01	3.5	2.326291e-04	5.9	1.817507e-09
1.2	1.150697e-01	3.6	1.591086e-04	6.0	9.865876e-10
1.3	9.680049e-02	3.7	1.077997e-04	6.1	5.303426e-10
1.4	8.075666e-02	3.8	7.234806e-05	6.2	2.823161e-10
1.5	6.680720e-02	3.9	4.809633e-05	6.3	1.488226e-10
1.6	5.479929e-02	4.0	3.167124e-05	6.4	7.768843e-11
1.7	4.456546e-02	4.1	2.065752e-05	6.5	4.016001e-11
1.8	3.593032e-02	4.2	1.334576e-05	6.6	2.055790e-11
1.9	2.871656e-02	4.3	8.539898e-06	6.7	1.042099e-11
2.0	2.275013e-02	4.4	5.412542e-06	6.8	5.230951e-12
2.1	1.786442e-02	4.5	3.397673e-06	6.9	2.600125e-12
2.2	1.390345e-02	4.6	2.112456e-06	7.0	1.279813e-12
2.3	1.072411e-02	4.7	1.300809e-06		

٢٠١٦/١/١٨ - ٤ اتصالات - مقرر اختياري ٤ - نظم الاتصالات الخلوية

كلية الهندسة بحلوان	Dept/Division : **Electronics, Communications & Computer Engineering** Academic level: **B.Sc., Communications** Semester: **First 2015/16** Course code & title: **(ELC 8415)** **Elective-3 (Cellular Communication Systems)** Instructors: **Dr. Osama Elghandour and Dr. Mahmoud Elmesalawy** Total mark: **100 Marks** Time allowed: **3 hrs.**	جامعة حلوان

Answer all questions: ***Write each question number and part number ahead of your answer.***

Question 1: [20 Marks]

Describe in detail each of the following:

a) Handover techniques and difference between Inter and Intra handover.
b) Hierarchical of frame structure for GSM Network.
c) Visitor Location Register.
d) Encryption method in GSM Network.

Question 2: [15 Marks]

Suppose that a mobile station is moving along a straight line between base stations BS1 and BS2. The distance between the base stations is 2000 m. If received power in dBm at base station i from mobile is modeled as a function of distance on uplink as follows

$$P_{r,i}(d_i) = P_o - 10n \log_{10}(d_i/d_o) \qquad i = 1, 2$$

Where d_i is the distance between the mobile and the base station i, in meters, P_o is the received power at distance d_o from the mobile antenna. Assume P_o = 0 dBm, d_o = 1 m, let path propagation loss factor is equal 2.9. Assume the minimum usable signal level for acceptable voice quality at base station receiver is $P_{r,min}$ = -88 and the threshold level used by the switch for handoff initiation is $P_{r,ho}$. Consider that the mobile is currently connected to BS1 and is moving with a speed 22.22 m/s and is moving toward a handoff. If time required to complete a handoff once the received signal level reaches the handoff threshold $P_{r,ho}$ is Δt = 4.5 sec. **Determine** the minimum required margin $\Delta = P_{r,ho} - P_{r,min}$ to assume that calls are not lost due to weak signal condition during handoff.

Hint: distance travelled during handoff/mobile speed≥ 4.5 sec.

Question 3: [15 Marks]

Assume that a cell named Radio Knob has 57 channels, each with an effective radiated power of 32 watt and a cell radius of 10 km. The path Loss is 40 dB/decade. The GOS is 5 % , assume call length is two minutes , and each user averages two calls per hour , assume the call has just reached its maximum capacity and must be split into four new microcells to provide four times the capacity in the same area. Erlang model: 57chs :GOS=5 : traffic:51.528 erlang

a) What is the current capacity of Radio Knob cell?
b) What is the radius and transmit power of the new cells.
c) How many channels are needed in each of the new cells to maintain frequency reuse stability in the system?
d) Show how you will assign frequencies to one of the new cells.
e) If traffic is uniformly distributed, what is the new traffic carried by each new cell.

Question 4: **[20 Marks]**

a) In WCDMA, **what** is the purpose of power control in both, uplink and downlink directions?

b) **Sketch and explain** briefly the UMTS air interface protocol architecture.

c) **Differentiate** between scrambling, channelization and synchronization codes in terms of its usages.

d) **Sketch** the UMTS frame structure for downlink DPCH and **explain** its fields.

e) A UMTS network consists of 500 tri-sectors sites with antenna gain and voice activity factors equal 2.67 and 2.4 respectively. Each site has the same frequency carrier and the user data rate R=12.2 Kbps. The signal power of each user is 45mW and the one-sided power spectral density of the AWGN is 10^{-11} W/Hz. If the minimum required E_b/I_0 is 10dB and the other-cell relative interference factor is 0.6, **calculate** the total capacity of the network.

Question 5: **[15 Marks]**

Given **HSPA** connections scenario shown in Figure 1. If MS1 uses HS-DSCH:{16-QAM, 2/4 Coding rate}, MS2 uses HS-DSCH:{QPSK, 3/4 Coding rate} and NB is configured with **15 HS-PDSCH**, answer the following questions:

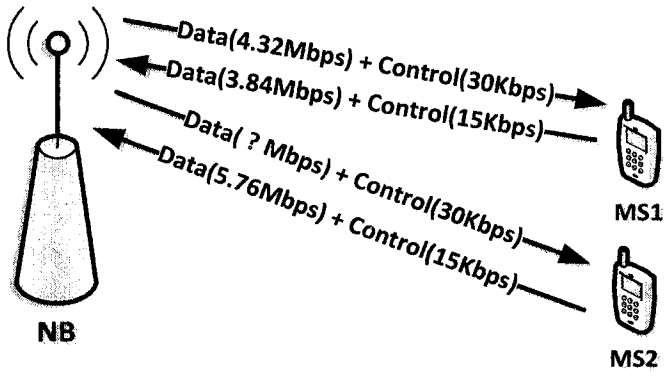


Figure 1. HSPA Connections

a) **How many** number of channelization codes are allocated to MS1 for its downlink and uplink data connections.

b) **What** is the maximum data rate that can be used by MS2 in downlink direction?

c) **Which** OVSF codes are used by each service in downlink and uplink directions for MS1 and MS2?

d) **How many** codes are available for the voice users with rate 15kbps in downlink direction?

Question 6: **[15 Marks]**

a) **State** the basic improvements in HSPA+ technology.

b) LTE is based on OFDM which suffer from the problem of high PAPR. **Explain** what this is about and **explain its implications** in the transceiver design.

c) Consider LTE based mobile system with bandwidth 1.4MHz. If the available RBs are allocated to users as shown in Figure 2, **calculate** the average data throughput in Mbps for UE#2, if the selected modulation scheme is 64-QAM and extended CP is used.

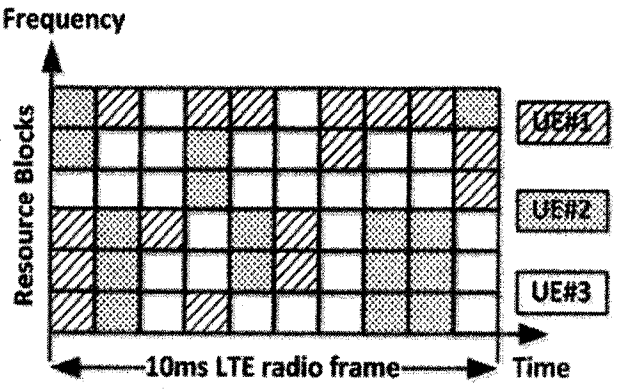


Figure 2. Scheduled data transmission

Good Luck

٢١/١/٢٠١٦ - ٤ اتصالات - عماره الحاسب

Faculty of Engineering	Dept: Electronics ,Communication and Computer Instructor: Dr. Rasha Fathy Aly Mostafa Courses code. & title: Computer Arch. And Org. Semester: first 2015-2016 Total mark: 70 marks Time allowed: 3 hrs	

Answer the following questions

Question 1(20 Marks):

a) Design an Arithmetic Logic Unit with two selection variables s_1 and s_0 that generates the following operations. Draw the circuit diagram of one typical stage:

s_1	s_0	F	
		C_i=0	C_i=1
0	0	A+B	A-B
0	1	-B	-A
1	0	A XNOR B	
1	1	A NAND B	

b) Draw a block diagram that illustrates the general configuration of a Micro-programmed control unit and explain the function of each block in your diagram then draw the block diagram of Micro-programmed control for processor unit.

Question 2 (15 Marks):

a) Show how Memory cells organize in 1-D and 2-D Memory arrays.

b) Design a direct mapping cache memory, Assume:

- Data word are *8 bits* long (i.e. 1 byte)
- A physical address is *20 bits* long
- The tag is *11 bits*

c) Define the virtual memory concept and list the main reasons for using it.

Question 3 (20 Marks):

a) Draw a block diagram and explain the operation of Bidirectional bus line with three-state buffers Register transfer.

b) Draw a block diagram and the state sequence of events of Asynchronous transfer using handshaking.

c) Draw a Daisy Chain priority diagram showing a stage of the daisy chain priority arrangement. Describing what happens when device 1 requests an interrupt after device 2 has sent an interrupt request to the CPU but before the CPU responds with the interrupt acknowledge?

Question 4 (15 Marks):

a) What are the differences among UMA, NUMA, and CC-NUMA?

b) What are some of the potential advantages of an SMP compared with a uniprocessor?

c) What is the problem caused by using two levels of cache memory in a SMP and what is its solution?

(Good Luck)