

PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination: Semester II

Academic Year: 2011

Date: 27 February 2012

Time: 09.00-12.00

Subject: 241-360 Introduction to Communication Systems and Networks Room: R200

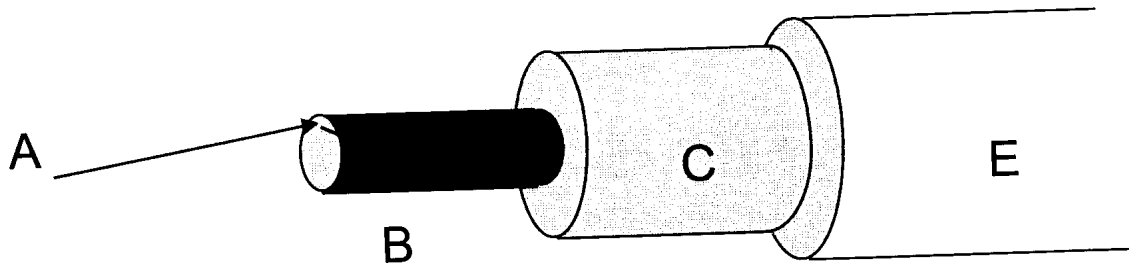
ทฤษฎีในการสอบ โทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทฤษฎี และพักการเรียน 1 ภาคการศึกษา

Part I

1. Select the best answer of each question: 2 marks for the correct one, -1 (minus one) for the wrong answer. No mark penalty if you leave the blank answers. (30 marks)

	A	b	c	d	e
1.1					
1.2					
1.3					
1.4					
1.5					
1.6					
1.7					
1.8					
1.9					
1.10					
1.11					
1.12					
1.13					
1.14					
1.15					

1.1 Which answer is correct for optical cable description?



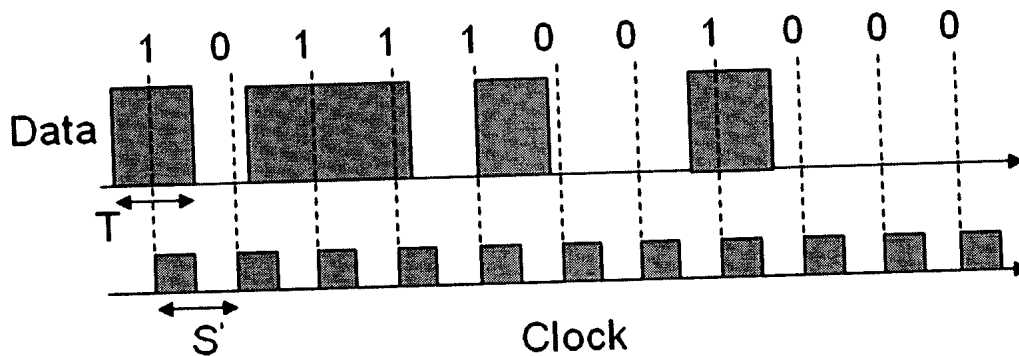
- a) A = Core, B = Light, C = Jacket, E = Cladding
- b) A = Light, B = Cladding, C = Jacket, E = Core
- c) A = Light, B = Cladding, C = Core, E = Jacket
- d) A = Light, B = Core, C = Cladding, E = Jacket
- e) No correct answer

1.2 which one is giving the bandwidth from low to high?

- a) UTP > Coaxial > Fiber Optic
- b) Coaxial > UTP > Fiber Optic
- c) Fiber Optic > Coaxial > UTP
- d) Fiber Optic > UTP > Coaxial
- e) No correct answer

1.3 Which one is the advantage of WDM (Wave Division MUX)?

- a) can be used for twisted-pair
- b) can be used with TDM switch
- c) give more channels than TDM and FM
- d) has a lower attenuation than TDM and FM
- e) all are correct.



1.4 What is the cause of this figure?

- a) synchronization
- b) multiplexing
- c) attenuation
- d) data loss
- e) no correction answer

1.5 Consider asynchronous transmission in the form of 7-bit characters with one start bit and 1.5 stop bits. For a 10 kbps link, let the sampling instants at the receiver be in the middle of each bit. What is the maximum tolerance of the alignment between the transmitter and receiver clocks for correct reception of character on this line?

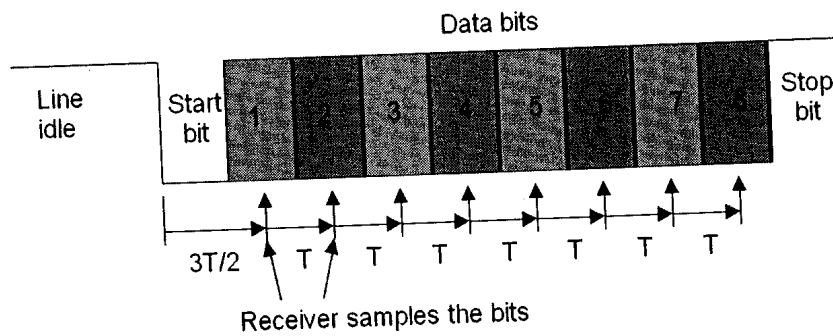
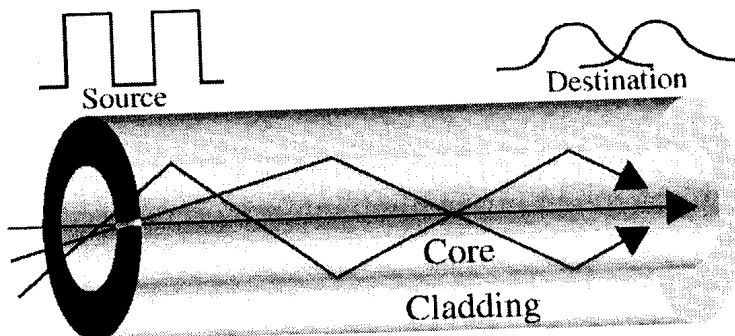


Figure 1 Frame Format of a asynchronous serial communication

- a) 100 usec
- b) 50 usec
- c) 6.67 usec
- d) 6.33 usec
- e) No correct answer

1.6 What is it called? (2 marks)

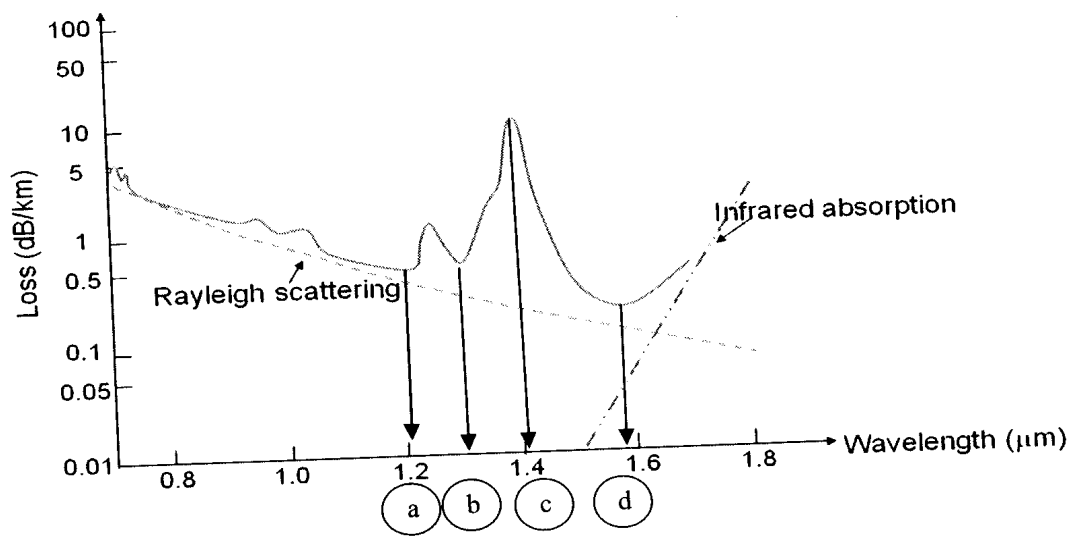


- a) Wavelength dependence
- b) Dense WDM
- c) Multimode Graded - Index
- d) Multimode Step - Index
- e) No correct answer

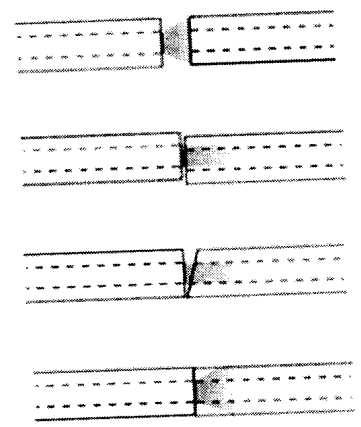
1.7 Which one is true for fiber optic? (2 marks)

- a) Very low attenuation
- b) Noise immunity
- c) Extremely high bandwidth
- d) No corrosion
- e) All are correct.

1.8 Which point is the best for fiber optic to use? (2 marks)

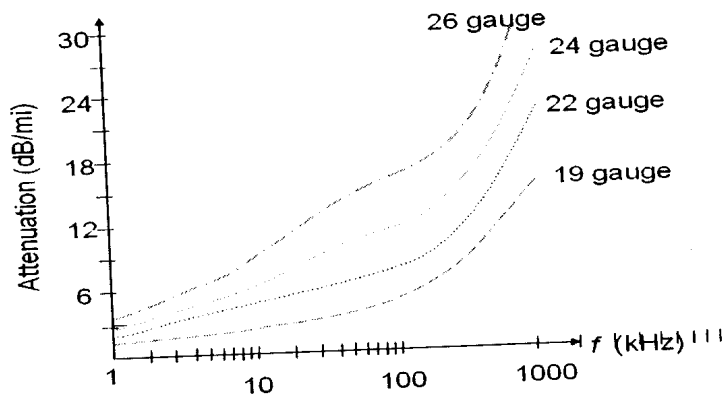


1.9 What is the sequence of the below problems in fiber optic? (3 marks)



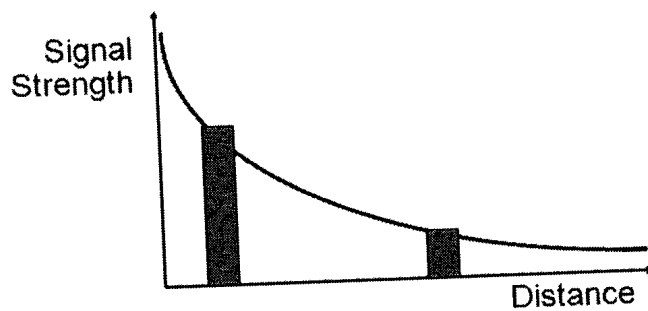
- a) End Gap, Concentricity, Eng Angle, NA Mismatch
- b) End Gap, , Eng Angle Concentricity, NA Mismatch
- c) Concentricity, End Gap, Eng Angle, NA Mismatch
- d) End Gap, Concentricity, NA Mismatch, Eng Angle
- e) Eng Angle, End Gap, Concentricity, NA Mismatch

1.10 Which one is true? (3 marks)



- a) Higher gauge number, higher attenuation
- b) Lower gauge number, higher frequency
- c) 19 gauge cable gives a longer distance than others
- d) At 100 kHz frequency, 22 gauge cable has a lower attenuation than 26 gauge cable
- e) All are correct.

1.11 What is the effect called? (2 marks)



- a) Our of phase
- b) Phase shift
- c) Attenuation
- d) Distortion
- e) No correct answer.

1.12 Which one does describe 'baseband'? (3 marks)

- a) Divides the total bandwidth into many channels
- b) Each channel can carry a different signal

- c) carry many simultaneous transmissions
- d) voice and data share the same cable
- e) No correct answer

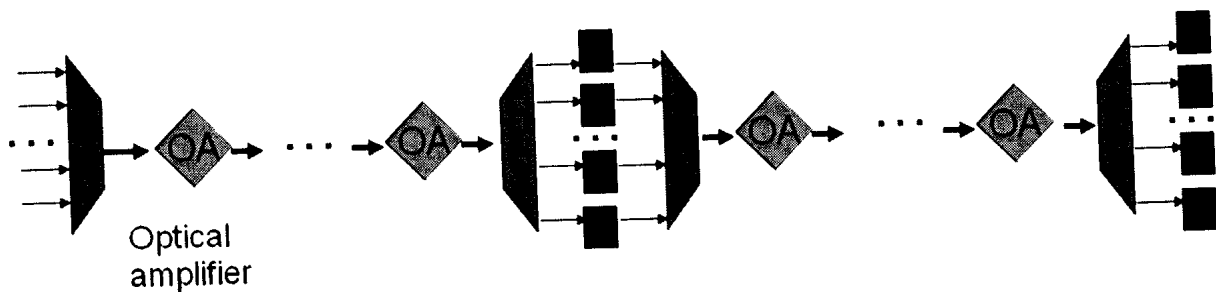
1.13 Which one does describe 'Full Duplex'? (3 marks)

- a) allow data to be sent in both directions simultaneously.
- b) A channel can be formed from two simplex channels carrying data in opposite directions. There is no waiting for turns or for the devices swap roles
- c) Both end can communicate simultaneously
- d) All are correct.
- e) No correct answer.

1.14 Which one can give the highest bandwidth? (2 marks)

- a) Twisted pair (UTP)
- b) Shielded twisted pair (STP)
- c) Fiber optic
- d) Infrared
- e) Microwave

1.15 Which one is the best to describe the below picture? (3 marks)



- a) Erbium Doped Fiber Amplifiers
- b) DWDM system
- c) Impairments in optical amplification
- d) Injection Laser diode (ILD)
- e) Dispersion in optical amplification

Part II

ARQ Protocols

(75 marks)

2. Answer the following questions for Go-Back-N ARQ

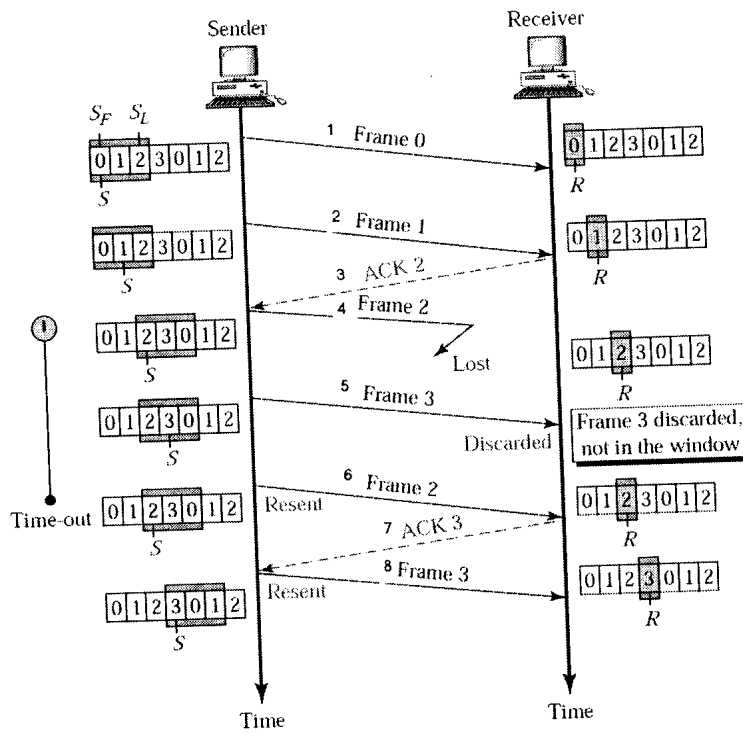


Figure 2 Go-Back-N ARQ

- 2.1 Why does the receiver not answer ACK (step no. 2) of Frame 0? (5 marks)
- 2.2 What happen if the receiver does not give ACK2 (step no. 3)? (5 marks)
- 2.3 What happen if the receiver does not send ACK 3 (step no. 7)? (5 marks)
- 2.4 In Go-Back-N ARQ, a window side must be lest a number of data unit in one block. Why? (5 marks)

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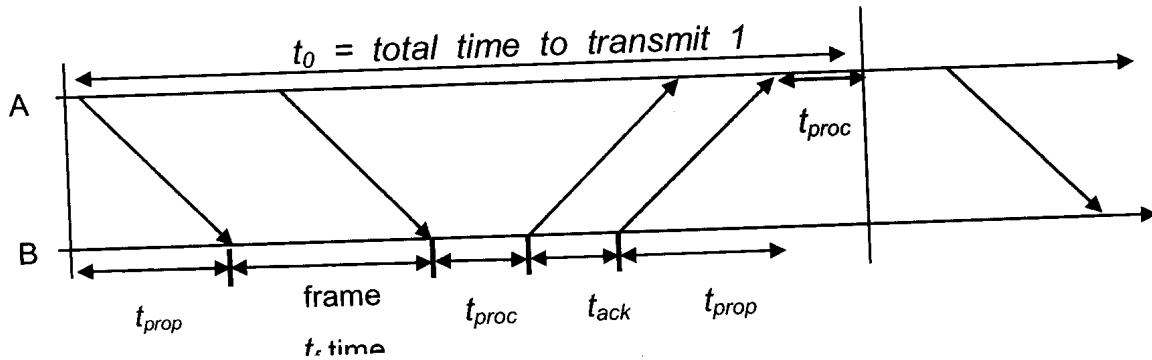
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6. Stop-and-Wait ARQ Protocol

(30 marks)

Figure 6 Stop-



and

Wait ARQ mechanism

Stop-and-wait ARQ transmission efficiency is described by:

$$\eta_0 = \frac{R_{eff}}{R} = \frac{n_f - n_o}{t_0} = \frac{1 - \frac{n_o}{n_f}}{1 + \frac{n_a}{n_f} + \frac{2(t_{prop} + t_{proc})R}{n_f}}$$

Assume that in our transmission system, the frame size is 1,250 bytes (including 250 bytes overhead), ACK frame size is 25 bytes. The channel bandwidth is 1 Mbps. What are the efficiency of the system when the round trip time are: (a) 1 ms, (b) 10 ms, and (c) 100 ms.

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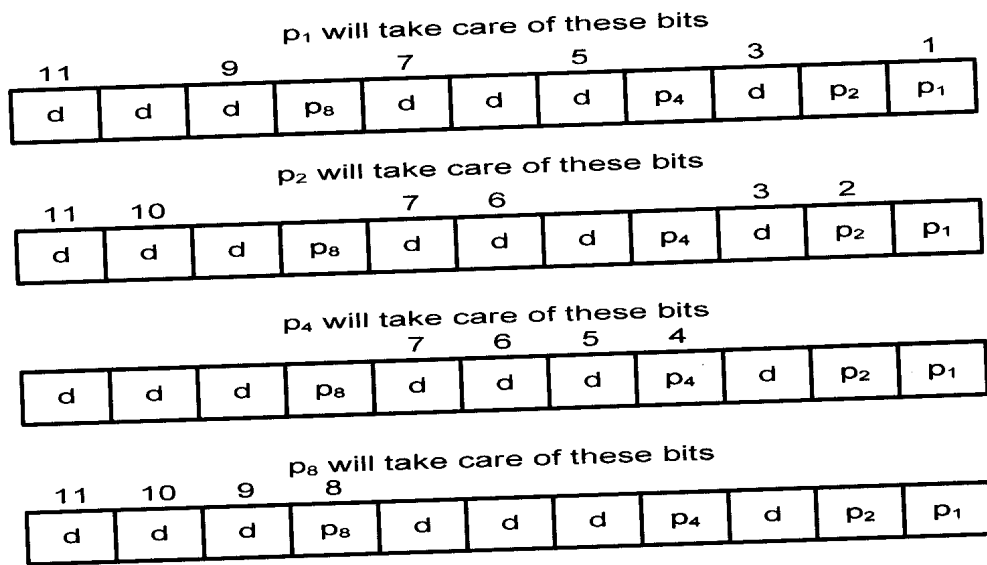
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Error Detection and Correction

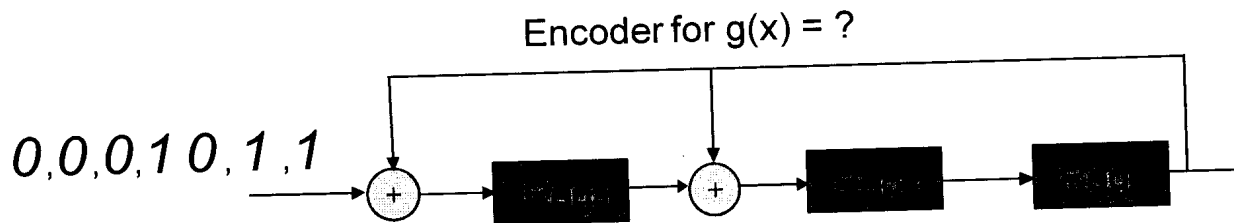
(50 marks)

7. Hamming Code can be applied for FEC (forward Error Correction) technique, as shown below



7.1 If the original data is 10011110011, what is the (15, 4) block error-correcting codes after using Hamming Code?

8. The below picture shows one cyclic redundancy check using a shift register circuit. Please fill in the given table before of each register value for each clock cycle. Also, please give the value of $g(x)$ and CRC.



Clock	Input	Reg 0	Reg 1	Reg 2
0	-	0	0	0
1				
2				
3				
4				
5				
6				
7				

$g(x) = \dots\dots\dots$

CRC = $\dots\dots\dots$

Answer

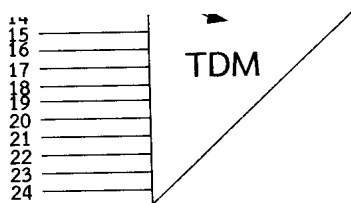
Clock	Input	Reg 0	Reg 1	Reg 2
0				
1				
2				
3				
4				
5				
6				
7				

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11.(a) What is the difference between circuit switching and packet switching? (b) What are the advantages and disadvantages of packet switching (compared to circuit switching)?

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12. 24 channels are multiplexed using TDM. If each channel sends 8,000 bytes/s. we multiplex 1 byte per channel and 1 Synchronizing bit is add to each frame. Find (1) the duration of 1 bit before multiplexing, (2) the frame rate, (3) the duration of each frame, (4) the number of bits in each frame, and (5) the data rate of the link.



Answer

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