

PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination: Semester II

Academic Year: 2012

Date: 22 February 2013

Time: 13.30-15.30

Subject: 242-214 การสื่อสารข้อมูล (Data Communications) Room: S817 , Robot

1. ข้อสอบมี 3 ตอน จำนวน 15 หน้า
2. ไม่อนุญาตให้นำเครื่องคิดเลขหรือเครื่องอิเล็กทรอนิกส์ทุกชนิดเข้าห้องสอบ
3. ไม่อนุญาตเอกสารหรือตำราทุกชนิด

ทุจริตในการสอบ โทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทุจริต และพักการเรียน 1 ภาคการศึกษา

Student Name:

Student ID:

Part One

1	2	3	4	5	6	7	8

9	10	11	12				Total

Part Two

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Part Three

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PART ONE

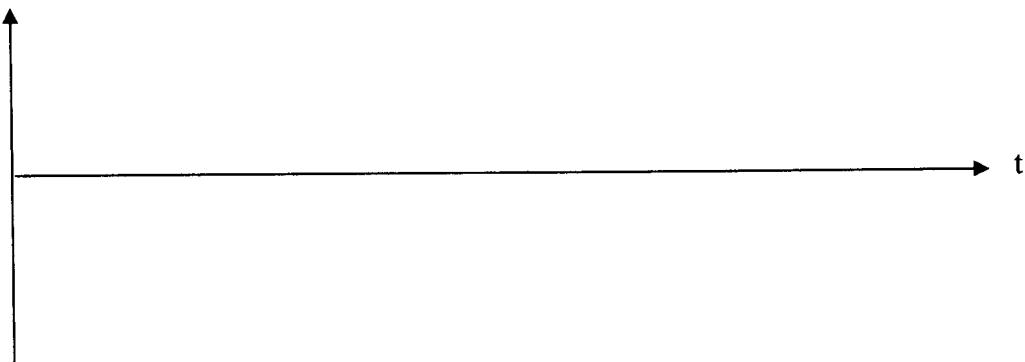
Analog Transmission

1. If our data bits are 01010011, then use the following modulations: ASK, FSK, and BPSK, draw their signal diagrams.

1.1 ASK (5 marks)

Answer

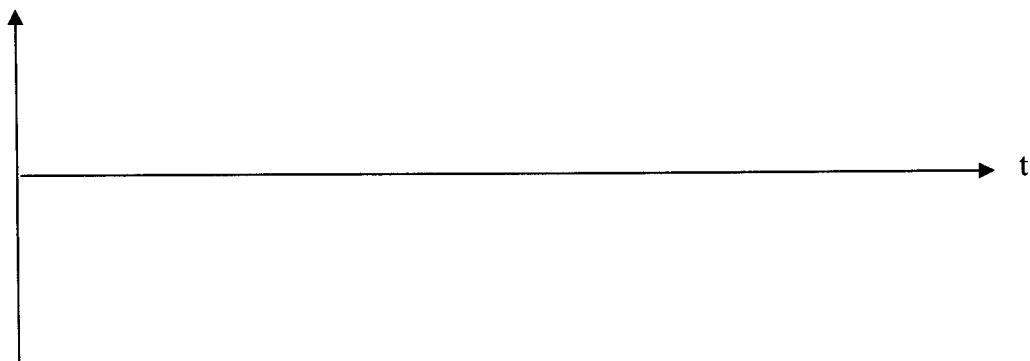
Amplitude



1.2 FSK (5 marks)

Answer

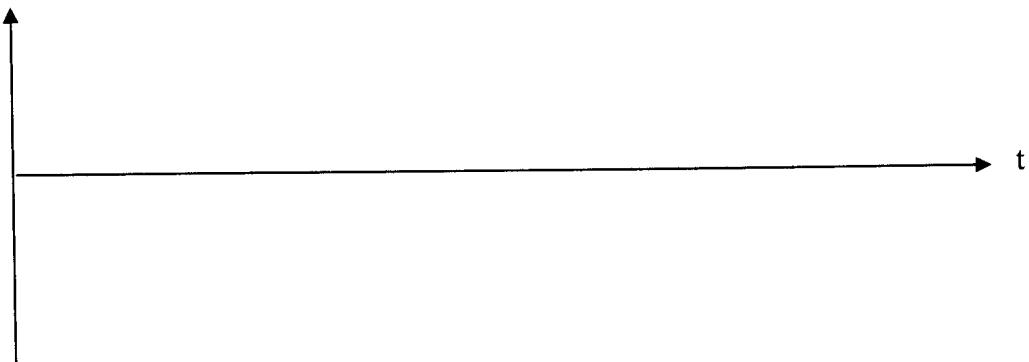
Amplitude



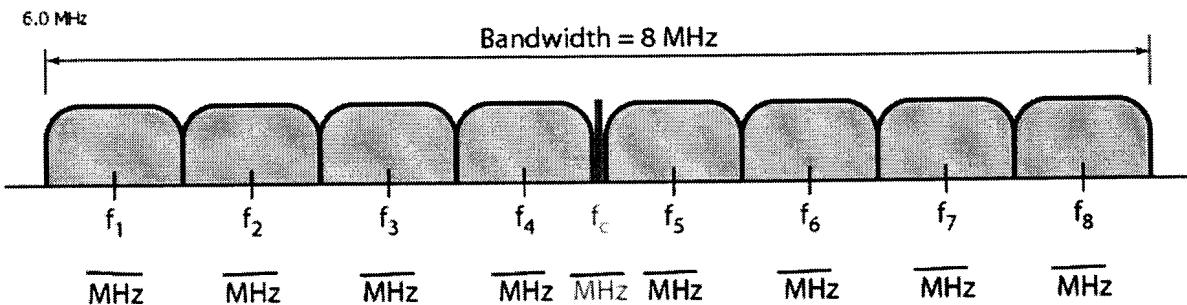
1.3 BPSK (5 marks)

Answer

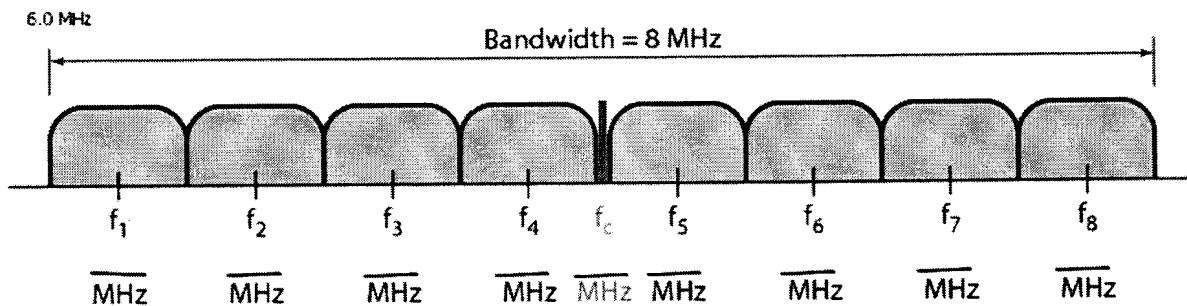
Amplitude



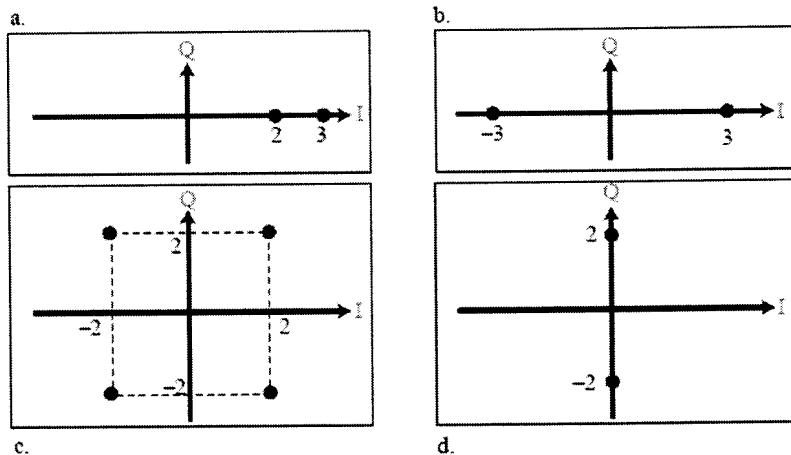
2. We need to send data of 3 bits at a time at a bit rate of 3 Mbps. The carrier frequency is 10 MHz. We can have $L = 2^3 = 8$ levels. The baud rate is $S = 3 \text{ Mbps}/3 = 1 \text{ Mbaud}$. This means that the carrier frequencies must be 1 MHz apart ($2\Delta f = 1 \text{ MHz}$). The bandwidth is $B = 8 \times 1 \text{ MHz} = 8 \text{ MHz}$. The result of the modulation frequency spectrum of the signal can be depicted in picture below, please complete all the carriers frequency (f_1 to f_8 , and f_c) in the figure below (10 marks).



Answer



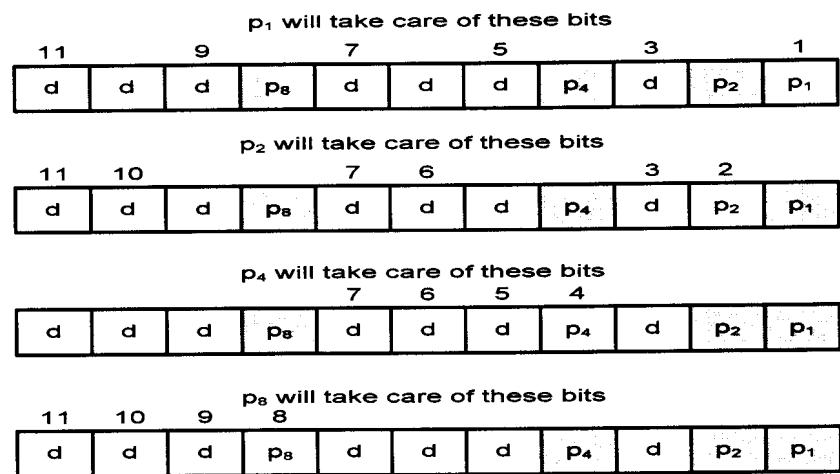
3. Below pictures are constellation diagrams which help us to define the amplitude and phase of a signal. Please describe what modulation technique is used for each constellation diagram given below: (20 marks)



Answer

Error Detection and Correction

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

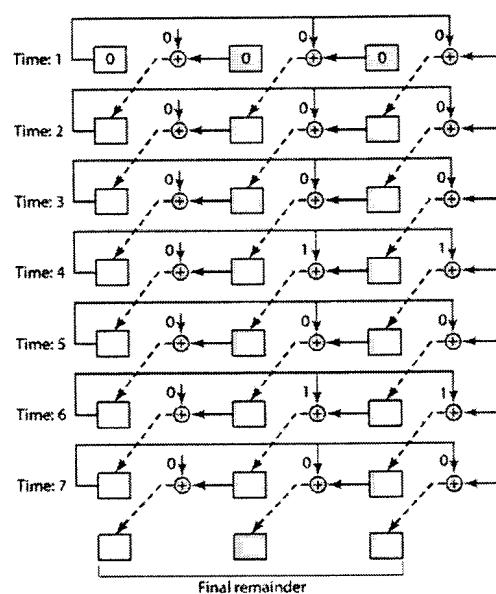


- 4.1 If the original data is 10011110011, what is the (15, 4) codeword after using the Hamming Code? (10 marks)

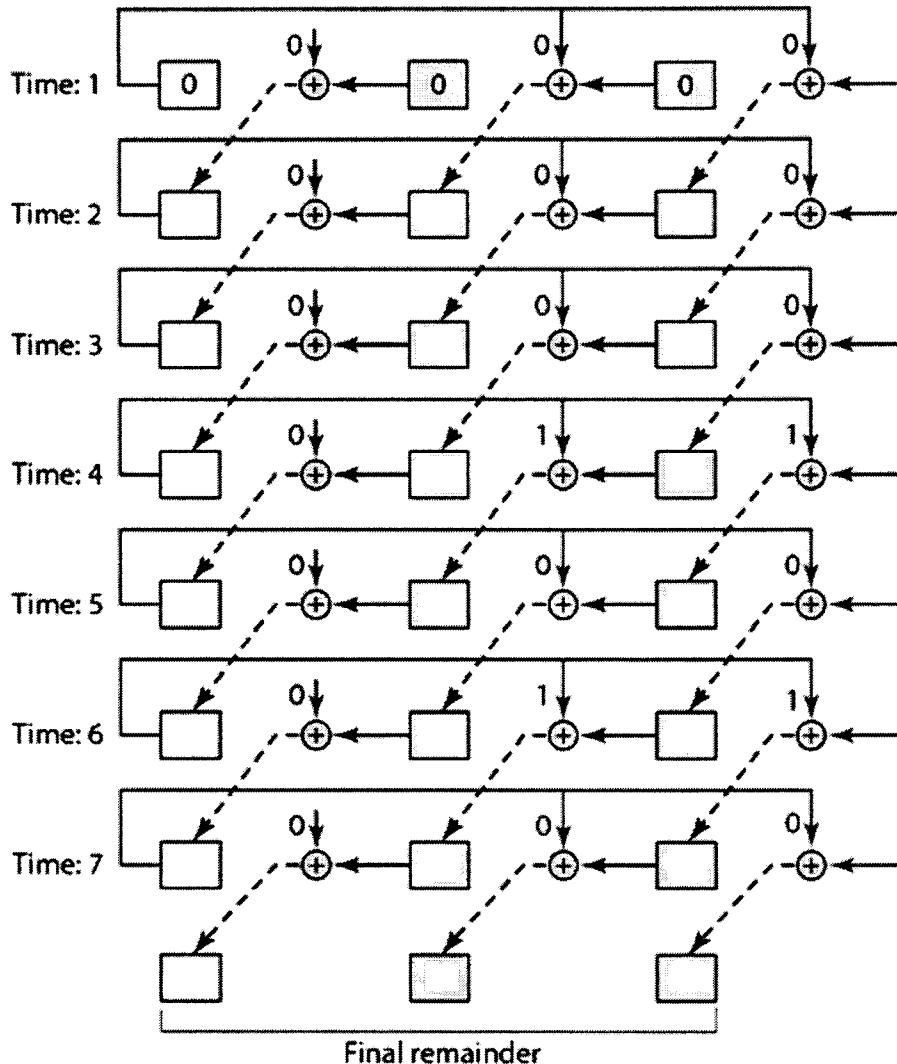
4.2 If the following data is received by the receiver, 100101110011101, is this data corrupted? If yes, what the number of error bits is? (15 marks)

Answer

5. The below picture shows one cyclic redundancy check using a shift register circuit. Please fill in each shift register value, and the remainder, if the codeword received is 1001000 (20 marks)



Answer



6. Suppose our data is a list of five 4-bit numbers that we want to send to a destination. If the set of numbers is (7, 11, 12, 0, 6), and if we use Internet checksum mechanism, what the sum of numbers is. Please all details how you obtain such value (10 marks).

Answer

7. Suppose a message is sent and a single bit error occurs. What bit number is error in given below table.

7	6	5	4	3	2	1	
1	1	1	0	1	1	0	7-BIT CODEWORD
1	-	1	-	1	-	0	(EVEN PARITY)
1	1	-	-	1	1	-	(EVEN PARITY)
1	1	1	0	-	-	-	(EVEN PARITY)

Answer

Multiplexing

8. (a) What is statistical multiplexing? (5 marks)
(b) Why does it differ from conventional multiplexing? (5 marks)
(c) What are the advantages of the statistical MUX compared to the convention MUX? (5 marks)

Answer

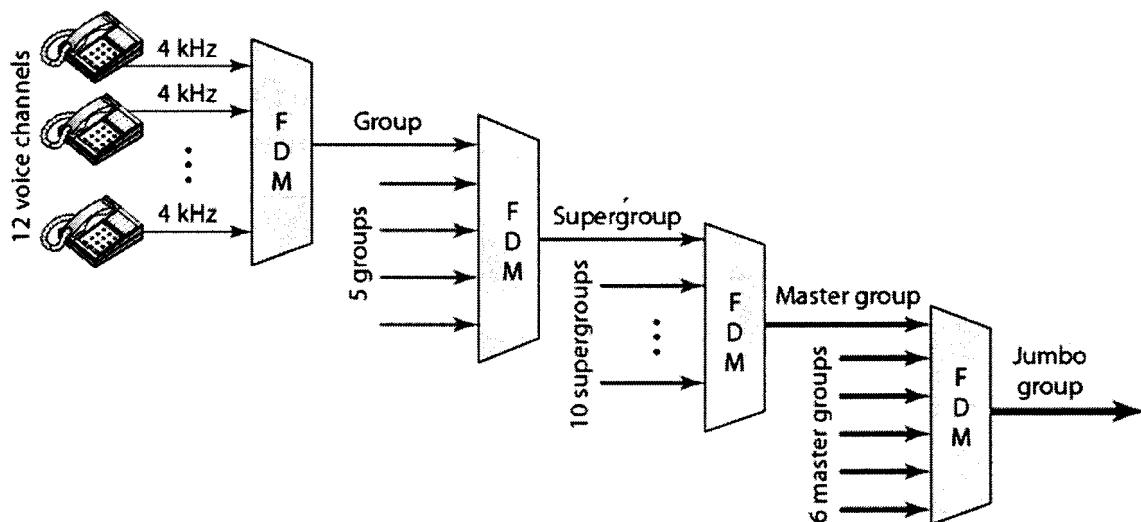
9. (a) What is the difference between circuit switching and packet switching? (b) What are the advantages and disadvantages of packet switching (compared to circuit switching) ? (10 marks)

10. Two offices are communicating using TDM; four 2-Kbps connections are multiplexed together. A unit is 1 bit. Find

 - (a) the duration of 1 bit before multiplexing, (3 marks)
 - (b) the transmission rate of the link, (3 marks)
 - (c) the duration of a time slot, and (3 marks)
 - (d) the duration of a frame? (3 marks)

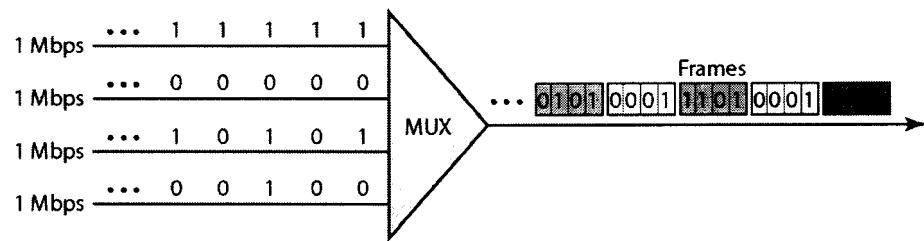
Answer

11. In analoug phone system, voices are multiplexed in analoug hierarchy. Please find bandwidth need for Jumbo group in below figure (10 marks)



Answer

12. The figure shows synchronous TDM with 4 1Mbps data stream inputs and one data stream for the output. The unit of data is 1 bit. Please use all information appeared in the figure to answer the following questions:



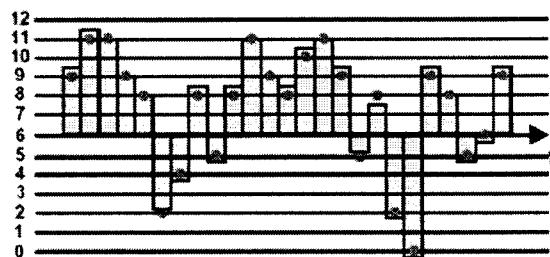
- a) The input bit duration (3 marks)
 - b) The output bit duration (3 marks)
 - c) The output bit rate (3 marks)
 - d) The output frame rate (3 marks)

Answer

Part Two

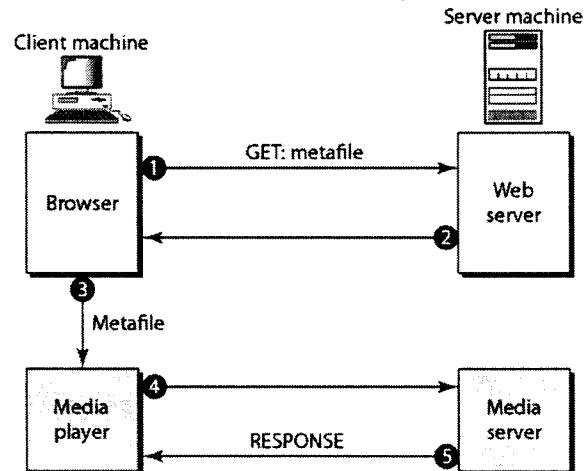
เลือกคำตอบที่ถูกที่สุดเพียงข้อเดียว (เลือกมากกว่า 1 ข้อ จะคะแนน -1 หากคำตอบถูกกี่ตัว ก็หักคะแนน หากตอบผิดกี่ตัว ก็หักคะแนน)

1. What is this step called in voice processing?



- a) Digitization
- b) Quantization
- c) Sample and Hold
- d) Analog to digital conversion
- e) Digital to Analog conversion

2. What is the command signal in step 2?



- a) Setup
- b) Response
- c) Play
- d) Pause
- e) Get: audio/video file

3. What is the command signal in step 4

- a) Setup
- b) Response
- c) Play
- d) Pause
- e) Get: audio/video file

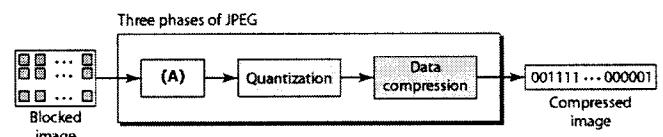
4. Which one is true for G.711 audio codec?

- a) Bit rate is 64 kbps
- b) There are 2 sub-version: u-Law and A-law
- c) Sampling rate is 8 kbps
- d) Sampling size is 8 bits
- e) All of above

5. Which one is the advantage of G.723 over G.711

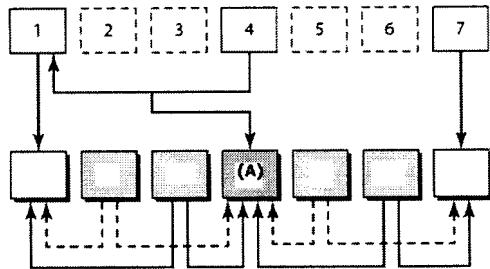
- a) Lower bit rate
- b) Sample size is bigger
- c) More delay in packetizing
- d) Need low bandwidth
- e) All of above

6. Below is a video process. What is (A)?

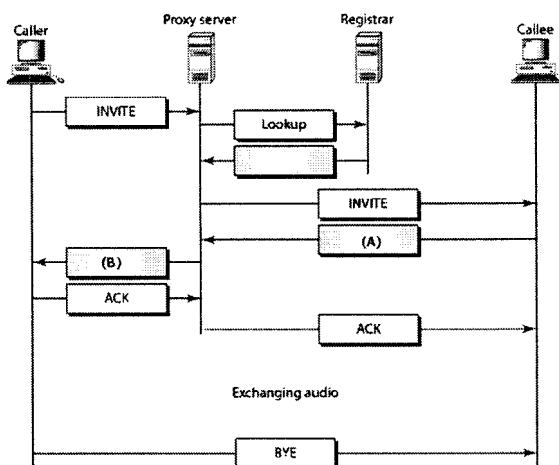


- a) Discrete Cosine Transform (DCT)
- b) Pulse code modulation (PCM)
- c) Video codec
- d) Analoug to digital conversion
- e) No correct answer

7. Below is MPEG process. What is (A)?



8. Which one is NOT a SIP message?
- Invite
 - Response
 - Bye
 - Option
 - Register
9. Below is SIP signal flow. What is signal (A) called?

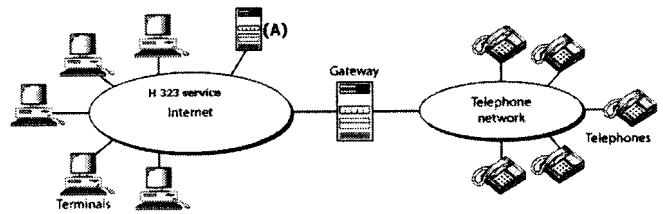


- Register
- Response
- OK
- Option
- Ack

10. What is signal (B) called?

- Register
- Response
- OK
- Option
- Ack

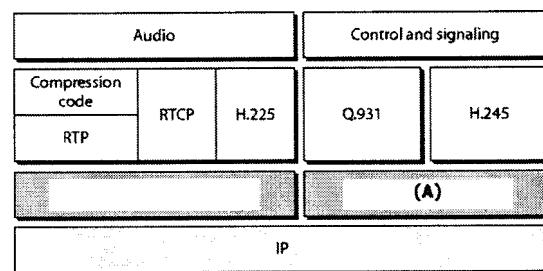
11. In H.323 service, what (A) is called?



- H.323 server
- Gatekeeper
- Domain Name server
- Registration server
- H.323 Gateway

12. Below is H.323 protocol usage.

What is (A) protocol?



- TCP
- UDP
- RTP
- RTSP
- HTTP

Part Three

ให้ตอบ T หากข้อความถูกต้อง ตอบ F หากข้อความไม่ถูกต้อง ตอบถูกได้ 1 คะแนนตอบผิดได้ -1 คะแนน

1. Streaming stored audio/video refers to the broadcasting of radio and TV programs through the Internet.
2. Spatial samples is the digital value of sampling points in a video frame.
3. The picture quality of video is depended on the temporal sampling rate or frame rate.
4. P-frame contains only the changes from the preceding frame.
5. Spread spectrum is a communication technique that spreads a narrowband communication signal over a wide range of frequencies for transmission