Roll No. : _____

5E3252

Total Printed Pages : 4

B. Tech. (Sem. V) (Main/Back) Examination, December - 2013
Computer Science
(Common for Computer & IT)
5CS3 Telecommunication Fundamentals

Time : 3 Hours]

[Total Marks : 80
[Min. Passing Marks : 24

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. _____NIL_____   2. _____NIL_____

UNIT - I

1   (a)   For an encoding scheme $\frac{E_b}{N_o}$ = 8.4 dB is required for a bit error of 10^{-4}. If the effective noise temperature is 290°K and the data rate is 2400 bps, what received signal level is required ?

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(b)   An NRZ-L signal is passed through a filter with r = 0.6 and then modulated onto a carrier. The data rate is 2400 bit/sec. Evaluate the bandwidth for ASK and FSK.

Assume Δf = 5 kHz for FSK.

4

(c)   List two major functions performed at each layer of TCP/IP model. What are the major differences in the services at data link layer and transport layer ?

7

OR

1   (a)   Explain the synchronization problem. How to solve it ? Explain with suitable diagrams.

6

(b) Calculate bandwidth required to transmit the video signal of T.V. made of 300,000 small picture elements. Each element can assume to distinguish brightness levels (such as black and shades of gray) for proper contrast, equally likely to occur. There are 30 picture frames being transmitted per second. Signal to Noise level is to be maintained 30 dB for satisfactory reproduction.

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(c) A transmitter radiates 20 watts of power at a wavelength of 4 cm. Calculate the power received by an antenna at a distance of 100 km if the gain of the transmitting and receiving antenna are equal and have a value of 30 dB.

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UNIT - II

2 (a) Generate the CRC code for message 1101010101. Given generator polynomial.
$g(x) = x^4 + x^2 + 1$

8

(b) Draw the sender and receiver window for a system using GO-Back-N-AKQ given the following :
(i)   Frame 0 is sent, frame 0 is acknowledged
(ii) Frame 1 and 2 all sent' frame 1 and 2 are acknowledge
(iii) Frames 2, 4 and 5 are sent; frame 4 is acknowledged; timer for frame 5 expires.

8

OR

2 (a) Explain Linear Codes and how error you detect and correct using linear code techniques.

7

(b) Calculate the throughput for stop and wait flow control mechanism if the frame size is 4800 bits, bit rate is 9600 bps and distance between device is 2000 km. Speed of propagation over the transmission media is 2,00,000 km/s.

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(c) A channel is operating at 4800 bps and propagation delay is 20 ms. What would be the minimum frame size for stop-and-wait flow control to get 50% link utilization efficiency ?

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UNIT - III

3 (a) Explain the working of PPP with the help of phase diagram. List all the activities carried out during each phase.

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(b) Show that the slotted ALOHA has a maximum throughput of twice the maximum throughput.

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(c) A 1 km, 10 Mbps CSMA/CD LAN has a propagation speed of 200 m/μ sec. Data frames are 256 bits long, including 32 bits of header, check sum and other overhead for the receiver to capture the channel to send a 32-bit acknowledgement frame. What is the effective data rate, excluding overhead, assuming there are no collisions ?

6

OR

3 (a) Consider two stations on a baseband bus at a distance of 1 km from each other. Let the data rate be 1 Mbps, the frame length be 100 bits and the propagation velocity be 2×10^8 m/sec. Assume that each station generates frames at an average rate of 1000 frames/sec.
Find the probability of collision for a station which beings to transmit at time t for
(i) Pure ALOHA and
(ii) Slotted ALOHA

8

(b) Write short notes on :
(i) HDLC
(ii) Collision free protocol.

8

UNIT - IV

4 (a) Assume that the velocity of propagation on a TDM bus is 0.8 c (c = speed of light), its length is 10 m and the data rate is 500 Mbps. How many bits should be transmitted in a time slot to achieve a bus utilization of 99% ?

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(b) Explain and compare synchronous TDM and statistical TDM.

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(c) Explain the operations of ADSL using Discrete Multi Tone (DMT). Draw block diagram of DMT transmitter.

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OR

4 (a) How a frame is constructed when N number of sources are multiplexed into a single channel using synchronous TDM if :
(i) All the sources are of equal data rates.
(ii) One source emits at twice the data rates than others.

6

(b) Explain routing in circuit switched networks. Why is it required ? 4

(c) Ten analog signals that are bandwidth limited to frequencies below 16 kHz and sampled at the nyquist rate, the digitizing error is to be held below 0.2%. The signals are to travel on a synchronous TDM channel. What is the data rate required for the channel ? 6

UNIT - V

5 (a) What are the tasks of PN sequences in multiusers wireless or personal communications CDMA system ? 5

(b) Explain working of FHSS. What are its advantages ? 4

(c) If $W = 1.25$ MHz, $R = 9600$ bps and a minimum acceptable E_b/N_o is found to be 10 dB, determine the maximum number of users that can be supported in a single cell CDMA system using

(i) Omni directional base station antenna and no voice activity detection.

(ii) Three sectors at the base station and activity with $\alpha = 3/8$. Assume the system in interference limited. 7

OR

5 (a) An FHSS system employs a total bandwidth of $W_s = 400$ MHz and in individual channel bandwidth of 100 MHz. What is the processing gain of FHSS system ? 4

(b) Describe direct sequence spread spectrum technique. 4

(c) Write short notes on :
(i) PN sequence
(ii) Orthogonal codes in SS system. 8