5E3252-P

Roll No. : _____ Total Printed Pages : 4

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B. Tech. (Sem. V) (Main) Examination, December - 2011
Computer Science
5CS3 Telecommunication Fundamentals (Common for Comp. & IT)

Time : **3** Hours] [Maximum Marks : **80**
[Min. Passing Marks : **24**

Instructions to Candidates :

*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

Assume Boltzman constant = 1.38×10^{-23} m^2 kg S^{-2} K^{-1}.

UNIT - I

1 (a) In a transmission line, the input power is 4mw. The line segment 1 has a loss of 12 dB, amplifier has a gain of 35-dB while the line segment 2 has an attenuation of 10 dB. Find the output power at the end of line segment 2. **3**

(b) If the received signal level for a particular digital system is –151 dBW and the receiver system effective noise temperature is 1500 °K what is E_b/N_o for a link transmitting 2400 bps. **3**

(c) Show that doubling the transmission frequency or doubling the distance between transmitting antenna and receiving antenna attenuates the signal by equal amount. Compute the attenuation. **4**

(d) Explain, with neat diagrams propagation of light through (i) step-index multimode, (ii) Graded index multimode and (iii) single mode fibre. Also show the output light pulse with respect to input light pulse when passed through each of the above three fibre types. **3+3=6**

OR

1 (a) Determine height of an antenna for a TV station that must be able to reach customers upto 80 km away. **2**

(b) Define the terms : (i) sampling error and (ii) quantization erorr. Also discuss the effects of errors and how to overcome error (S) ? **4**

(c) A transmitter is transmitting at 1 kbps. What will happen if the receiver clock is (i) slower and (ii) faster by 1% with respect to the transmitter when a 1000 bit frame is transmitted. Also suggest methods to overcome the problem. **3+3=6**

(d) Draw neat sketches showing different wireless propagation modes. (No description). Mention the range of frequencies for each mode. **4**

UNIT - II

2 (a) Suppose we want to transmit the message 11001001 and protect it from errors using the CRC polynomial x^3+1. Find (i) the trnsmitted word (ii) suppose the leftmost bit of the message is inverted due to noise on the transmission link. What is the result of receiver's CRC calculation ? How does the receiver know that an error has occurred ? **8**

(b) Assume that the sender and receiver has both their window size equal to 3 and the N^{th} frame is assigned a sequence number N and S. What will happen if the received frame contains a sequence number = 0 when 0 is the receiver's window ? Discuss all possibilities. **8**

OR

2 (a) Compute the minimum number bits to be used for sequence number in a sliding window protocal for a 1 Mbps point-to-point link with one way latency of 1.25 seconds. Assume each frame carries 1 kb of data. **6**

(b) Two neighbouring nodes, A&B use a sliding window protocol with a 3-bit sequence number and go-back-N as the ARQ mechanism. Assuming A is transmitting and B is receiving. Show the window positions for the following succession of events.

(i) Before A sends any frame

(ii) After A transmits frames 0, 1 snd 2 and receives acknowledgements for 0 and 1.

(iii) After A sends frames 3, 4 and 5 and receives acknowledgement for 4.

$1+1\frac{1}{2}+1\frac{1}{2}$

(c) Draw the window positions in (b) above if selective repeat is used in stead of go-back-N. Also explain the difference in windows in two cases.

$1+1\frac{1}{2}+1\frac{1}{2}+2$

UNIT - III

3 (a) Derive the expression for throughput of an unslotted CSMA carrier. Enumerate all the assumptions.

8

(b) Write short notes on (i) HDCC and (ii) PPP. Also list one difference in the two protocals.

8

OR

3 (a) Show that in an n-station slotted ALOHA systeim, the probability of success of an arbitrary station is np $(1-p)^{n-1}$; where p = possibility that a station will transmit in each slot.

4

(b) Show that the maximum throughput of slotted ALOHA is twice that of the pure ALOHA.

8

(c) Explain working of PPP.

4

UNIT - IV

4 (a) Consider a 60-channel FDM system with a maximum base-band frequency of 252 KHz. Assume that a FDM multichannel rms frequency deviation of 546 KHZ is used. Calculate

(i) Bandwidth of the FDM-FM-FDMA carrier

(ii) FDM multichannel loading factor

(iii) O-dBM test-eone rms frequency derivation.

6

(b) Describe working of ADSL.

4

(c) Ten 9600-bps lines are to be multiplexed using TDM ignoring overhead bits in the TDM frame, what is the total capacity required for synchronous TDM ? Assuming that we wish to limit average link utilization of 0.8 and assuming each link is busy 50%, what is the capacity required for statistical TDM ?

6

OR

4 (a) Draw TDMA burst structure. Explain the different fields in brief.

8

(b) Draw the schematic of DS-1 frame. List the differences when DS-1 is used for (i) voice transmission and (ii) Digital data service.

8

UNIT - V

5 (a) Explain working of FHSS. What are its advantages ?

3

(b) In an FHSS system for the generation of hoping frequencies, a 3-bit pseduo number code generator is used. The carrier frequency is 8 KHz and the frequency spacing is 0.5 KHz. corresponding to code pattern 000, the frequency is 9.75 KHz. Find all the hoping frequencies. Show all the frequencies on the frequency time plane.

4+3=7

(c) An FHSS system employs a total bandwidth of W_s = 400 MHz and an individual channel bandwidth of 100 Hz. What is the minimum number of PN bits required for each frequency nop ?

3

(d) An FHSS system using MFSK with M=4 employs 1000 different frequencies. What is the processing gain ?

3

OR

5 (a) Describe direct sequence spread spectrum technique. Compare it with FHSS.

3+3=6

(b) Define orthogonal codes. Show that the following set of codes is orthogonal

C1 = 1, -1, -1, 1, -1, 1

C2 = 1, 1, -1, -1, 1, 1

C3 = 1, 1, -1, 1, 1, -1

4

(c) Define Hands-off. List the difficulties in carrying out hand-offs in CDMA systems. Explain approaches of hand-off.

6