

College of Engineering, Pune
End Semester Exam
(T.Y. B.Tech) – (E & TC)
(ET – 316) – (Data Communications)

Date: __ May 2012
Academic year : 2011-12

Timing : 3 Hours
Max. Marks : 50

Instructions:

1. All Questions are compulsory.
2. Draw neat diagram wherever necessary.
3. Figure to the right indicate full marks.

Q.1

- A. Explain in brief routing within Virtual Circuit subnet and routing within datagram subnet. (6)
- B. Compare Twisted pair cable, Co-axial cable and Fiber Optic cable on following basis –
- a. Ethernet Standard
 - b. connectors used
 - c. data rates
 - d. Standard length of cable
 - e. number of nodes/tapping
 - f. Applications (4)

Q.2

- A. Explain how internet data and video can be send over the same cable in a cable TV network. (6)
- B. Explain operation of ADSL modem on the customer site and DSLAM at telephone company site. (4)

Q.3

- A. A multiplexer combines 4, 100kbps channels using time slot of 2 bits per channel.
Calculate - a. bits/frame b. frames / sec. c. frame duration d. bit rate e. bit duration (6)
- B. Compare LEO Vs MEO Vs GEO. (4)

Q.4

- A. Explain the control field in HDLC frame. (6)
- B. Calculate the transmitted frame using CRC.
Message frame : 1 1 0 1 0 1 1 0 1 1
Generator polynomial : 1 0 0 1 1 (4)

Q.5

- A. Explain TCP/IP protocol suite. (5)
- B. Compare Circuit switching with Packet switching (5)

EGTC

College of Engineering, Pune
END SEMESTER EXAM
Year (T. Y. B.Tech)
(ET-311) - (Electromagnetic Waves)

Day & Date: Tuesday, 08/05/12
Timing: 2.00pm to 5.00pm

Max. Marks: 50
Duration: 3 Hrs.

Instructions:

1. Figures to the right indicate full marks.
 2. Assume Suitable data wherever necessary.
 3. Draw neat figure wherever required.
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- Q.1 a) Explain the application of transmission line as voltage or current step-up transformer. [3]
- b) A 70Ω line is terminated in an impedance of $50 + j10 \Omega$. Find the position and the length of a short circuited stub required for the matching if the stub is to be added in parallel. [4]
- c) Just inside the surface of a dielectric slab the electric field is 10 V/m and makes an angle of 60° with the surface. If the dielectric constant of the slab is 4, find the electric field and its direction just above the surface. [3]
- Q.2 a) Derive maxwell's equation for electric field (\vec{E}) from Faraday's law of electromagnetic induction. Also explain the physical meaning of the Maxwell's equation $\nabla \cdot \vec{B} = 0$. [4]
- OR**
- a) A 10m long wire is aligned with z-axis and is symmetrically placed at the origin. Find the magnetic field at [4]
- i] point $(x, y, z) = (1, 2, 5)$
 - ii] point $(\rho, \phi, z) = (2, \pi/3, 10)$
 - iii] point $(r, \theta, \phi) = (10, \pi/3, \pi/2)$.
- b) What is phase velocity? Derive expression for phase velocity in Free space, pure dielectric, dielectric medium with loss and good conductor. Comment on each. [4]
- c) A RHE polarized wave with tilt angles 45° and $AR = 2$ is received by a LHC antenna system. Find the power transfer efficiency from the wave to the antenna. [2]

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- Q.3 a) For a wave travelling in +z direction, the electric field is given as [3]
- $$\vec{E} = (3 + j4)\hat{x} + (5 - j6)\hat{y}$$
- Find the maximum value of the electric field.

- b] The complex vector electric and magnetic fields in an ideal dielectric medium are given as [7]

$$\mathbf{E} = (-j\sqrt{3}\hat{x} + 2\hat{y} + j\hat{z})e^{-j0.02\pi(x+\sqrt{3}z)}$$

$$\mathbf{H} = \frac{1}{30\pi}(\sqrt{3}\hat{x} + j2\hat{y} - \hat{z})e^{-j0.02\pi(x+\sqrt{3}z)}$$

Show that these fields correspond to a uniform plane wave. Find frequency and velocity of the wave. Also find the phase velocities along x, y and z-directions. Find the state of polarization of the wave.

OR

- b] Explain reflection and refraction of wave at dielectric interface with [7]
 i] perpendicular polarization
 ii] parallel polarization
 iii] normal incidence

- Q.4 a] What will happen to polarization of wave at [3]
 i] simple reflection.
 ii] total internal reflection.

- b] In a parallel plate waveguide, the phase velocity of TE₃ mode is 1.4c. Find the guided wavelength of TM₂ mode inside the waveguide. The waveguide has been filled with a material having dielectric constant 9 and frequency of the wave is 1 GHz. [3]

- c] Inside an air-filled waveguide the total magnetic field is given as [4]
 $\mathbf{H} = 10\cos(\pi x)e^{-j\beta z}\hat{y}$ A/m
 Find the vector electric field, the phase constant β and the cut off frequency of the wave. The frequency of the wave is 2GHz.

- Q.5 a] Derive the relation between potential functions (A , V) and sources (J , ρ) stating Helmholtz theorem and Laurentz Gauge condition. Also give the reason for choosing Laurentz Gauge condition. [5]

- b] A z-oriented Hertz dipole of 0.1λ length at 10 MHz is located at the origin and excited with 100 A peak current. Find the vector electric and magnetic fields at a distance of 10km along the z-axis, and in the xy-plane. [3]

- c] What types of fields (regions) are generated due to Hertz dipole? At what distance from Hertz dipole do they become equal? [2]

College of Engineering, Pune

End Semester Exam – May 2012

Third Year B.Tech. (E & TC)

(ET 310)- (Coding Techniques in Communication Systems)

Day & Date- Sunday, 06/05/2012

Maximum Marks: 50

Time: - 2.00 to 5.00 pm

Duration – 3 Hrs.

Instructions:

- 1) All the major questions are compulsory. Regarding sub-questions follow the instructions specified at the beginning of each question.
- 2) Neat Diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.
- 4) Figures to the right indicate full marks.

- Q. 1 Attempt any FIVE sub-questions. (20)
- A. Prove that the entropy of a binary source peaks when symbols are equi-probable. What is the peak value of entropy for an M-ary source?
 - B. State the underlying principle of convolutional decoding. Derive expression for the parameter/s involved in the principle in terms of Hamming distance for the binary symmetric channel model with error probability 'p'.
 - C. Write down the expressions for average code length, code variance, code efficiency and redundancy with respect to any entropy coding technique.
 - D. Specify the four steps in K-means algorithm for vector quantization.
 - E. Encode the following binary sequence of size 62 bits using Lempel-Ziv source coding technique.
00010010000001100001000000010000001010000100000011010000000110
 - F. Specify (i) upper bound and (ii) lower bound on the rate-distortion and distortion-rate functions of a memory-less analog source with zero mean and finite variance σ_x^2 .
 - G. Are (7, 3), (7, 4) and (15, 11) perfect codes? Justify your answer.
- Q. 2 Draw the block diagram of an encoder for a linear (15, 5) cyclic code having a generator polynomial $g(X) = 1 + X + X^2 + X^4 + X^5 + X^8 + X^{10}$. Determine the code polynomial for the message polynomial $m(X) = 1 + X^3 + X^4$ by the normal division procedure. Also find out and list the states, feedback and message queue step by step as the circuit is clocked. Compare and comment on the step wise results of normal division and state transition table. Suggest modifications in the block diagram for decoding purpose. (10)

P.T.O.

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- Q. 3 Design an (5, 2) linear block code (LBC). (10)
- (a) Choose the code-words to be in systematic form, and choose them with the goal of maximizing d_{\min} .
 - (b) Find the generator matrix for the codeword set.
 - (c) Draw the logic circuit diagram for the LBC encoder.
 - (d) Enter all of n-tuples into a standard array.
 - (e) What are the error correcting and error-detecting capabilities of the code?
- Q. 4 A. Draw the state diagram, tree diagram and trellis diagram for the convolutional encoder with constraint length $K = 3$, code rate $\frac{1}{2}$ and connection vectors $g_1 = [1 \ 1 \ 1]$ and $g_2 = [0 \ 1 \ 1]$. (06)
- B. Draw and explain the logic circuit which is integral part of Viterbi convolutional decoding. (04)

COLLEGE OF ENGINEERING ,PUNE

END SEMISTER EXAMINATION 2011-2012

Subject Electronic Measurement

Program T.Y.B.TECH E TC

Date

Duration 3.00 Hrs

Max Marks 50

Instructions

- 1 Attempt any FIVE questions
- 2 Answers to the points are necessary
- 3 Donot carry Mobile phone and programmable calculators
- 4 Figures to the right indicates full marks
- 5 Draw neat diagrams wherever necessary
- 6 assume suitable data if necessary.

Q1 A suggest and briefly explain two most important key drivers those are driving present development in Oscilloscope 5

Q1 B A 5V sine wave is fed from wein bridge oscillator to the attenuator circuit.as shown below.
Calculate the values of R1,R2 and R3 to obtain output voltage ranges 0- 0.1V and 0- 1V . 5

Input bias current is $I_B = 1000 \text{ na}$

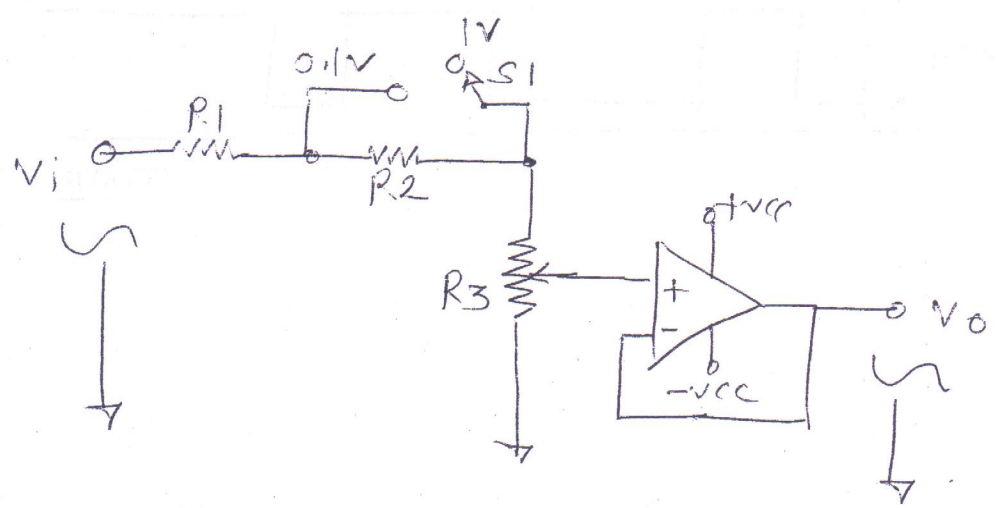


FIG. 1B

FIG 1B

Q2 A What is resolution of $3\frac{1}{2}$ digit DMM display on 1V and 10V ranges Calculate its sensitivity. 3

Q2 B A $3\frac{1}{2}$ digit seven segment LED display uses diodes with 20 ma current per segment .Determine

The power supply minimum voltage and current requirement to operate the display. 2

Q2 C How do you discriminate between the terms error and uncertainty in context with measurement 2

Q2 D Measurements of speed of sounds are given in m/s as 347.8, 343.4, 339.4, 342.1, 342.7, 338.8, 3

344.7 and 342.8 Calculate Average ,Std Dev and graphically represent plot precision of

measurement.

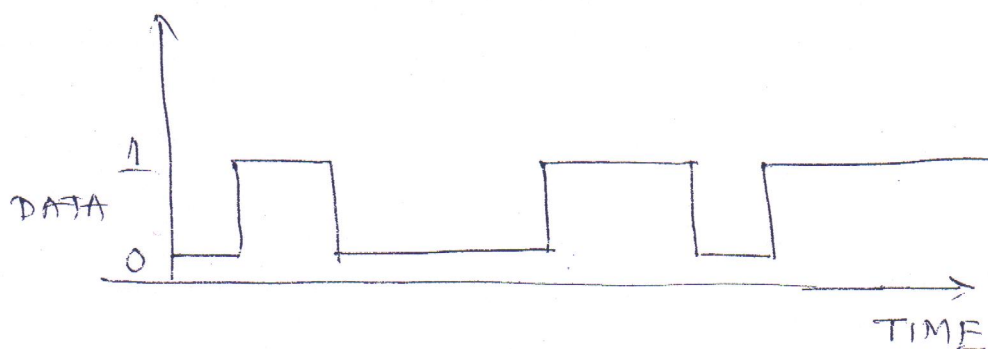
Q3 A Why would one use a direct digital synthesizer DDS Aren't there only other methods easily 5

Generating frequencies.

Q3 B Why DDS devices are preferred in data encoding Indicate desired output waveform with

Essential labeling to use DDS as FSK transmitter for given data as shown below. 5

FIG 3B



- Q4 A Draw basic block diagram of most commonly used spectrum analyzer. What type of spectrum analyzer is provided on add on card used in oscilloscope. How it is different than commonly used spectrum analyzer 6
- Q4 B Suggest and justify mode of operation of Universal frequency counter for following 4
- 1 finding out channel number of telephone in frequency division multiplexed system
 - 2 accurate frequency measurement of line frequency in noisy environment.
- Q5 A Explain ATE set up with block diagram for measurement of various parameter of radio Receiver. List parameters to be measured and control line used and equipments required for it. 5
- Q5 B Briefly explain Hardware and Software requirements for virtual instrumentation system. Assume typical specifications for such system 5
- Q6 The waveform Generator is configured as STIMULUS for cable test measurement (unknown length of twisted line wire) DSO AS display device.
- 1 Draw the expected display curve for an unknown length of wire connected with respect to a display curve without a DUT
 - 2 Calculate the impedance of twisted wire Z_{cbl} If the voltage measured as $\Delta y = 660\text{mv}$, with far end of the twisted pair wire is open circuit.
 - 3 Calculate the length of the cable , if the propagation delay for the twisted pair wire is 1.54 ns /meter and manually measured $\Delta x = 191\text{ ns}$

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