G 1336 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electronics and Communication Engineering

EC 010 704—ELECTRONIC INSTRUMENTATION (EC)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Draw the basic blocks of a generalised instrumentation system.
2. Define and explain gauge factor of strain gauge.
3. What are the precautions to be taken while using a bridge for measurement ?
4. At what frequency bands spectrum analyzers can be used ? Explain.
5. Mention the three basic types of dynamometer to measure torque.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Explain the various standards used in Instrument calibration.
7. Explain how displacement is measured using resistive potentiometer.
8. Obtain the balance equation for Schering Bridge used for measurement of capacitance.
9. List and briefly explain the five specifications that should be considered while selecting a recording instrument.
10. Describe the applications of piezoelectric transducers for pressure measurement. What are its merits and demerits ?

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Describe the different types of errors in measurement. What are their causes ? How they can be minimized ?

Or

Turn over

12. The following were the values obtained from the measurement of the value of a resistor :

222.2 Ω, 221.4 Ω, 229.0 Ω, 218.6 Ω, 221.4 Ω, 220.5 Ω, 221.8 Ω, 219.9 Ω, 222.5 Ω, 225.2 Ω.

Calculate :

(a) Arithmetic mean.

(b) Average deviation.

(c) Standard deviation, treating the data as finite.

(d) Variance.

13. (a) Describe the construction of foil type strain gauges and explain their advantages over wire-wound gauges. (8 marks)

(b) What is proximity sensor ? Explain its applications. (4 marks)

Or

14. With neat diagrams, explain the construction and principle of working of a linear voltage Differential Transformer. Explain how the magnitude and direction of displacement of the core of the LVDT can be detected ? Discuss its applications.

15. An Owen's bridge is used to measure the properties of a sample of sheet steel at 2 kHz. At balance, arm *ab* is test specimen ; arm *bc* is $R_3 = 100\ \Omega$, arm *cd* is $C_4 = 0.1\ \mu F$ and arm *da* is $R_2 = 834\ \Omega$ in series with $C = 0.124\ \mu F$. Derive balance conditions and calculate the effective impedance of the specimen under test conditions.

Or

16. With a block diagram, describe the functioning of RF telemetry. Compare the performances of the analog and digital types.

17. With a block diagram, explain the various functional units in a DSO. How a transient signal can be displayed and its parameters measured ?

Or

18. Draw and explain the architecture of PLC. Explain the programming of the same, with a typical case study.

19. (a) Explain the construction and working of a pH electrode. (6 marks)

(b) Explain the working principle of ultrasonic flow meter. (6 marks)

Or

20. (a) Explain with neat sketches, the construction and working of rotary vane flow meter. (6 marks)

(b) With neat sketches, explain the working of general purpose electric dynamometer to measure torque, with sketches. (6 marks)

[5 × 12 = 60 marks]

G 1347 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electronics and Communication Engineering

EC 010 705—EMBEDDED SYSTEMS (EC)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. List four requirements of an embedded system.
2. What are preprocessor directives ? Give two examples.
3. Define synchronous communication. Give an example.
4. What is the role of real time clock ?
5. Define process.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Discuss embedded system and discuss the classification of embedded systems.
7. Compare and contrast assembly language and high ?
8. Write short notes on UART.
9. Explain ADC interfacing.
10. Write notes on tasks and task states.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Explain the application of Embedded systems in consumer Electronics.

Or

12. Write notes on the application of Embedded systems in the following :—

    (a) Control system. (6 marks)

    (b) Handheld computers. (6 marks)

13. Explain the hardware architecture of an Embedded system.

Or

14. Write notes on Embedded C compiler and interfacing programs using C language.

15. Write notes on the following :—

    (a) PC to PC communication. (6 marks)

    (b) HDLC. (6 marks)

Or

16. Describe an embedded application over mobile network with the required source code listing.

17. Explain matrix keyboard interfacing with a neat block diagram and required source code in C.

Or

18. Explain interfacing with displays with illustrative diagram and source code in C.

19. Write notes on the following :—

    (a) Process management. (6 marks)

    (b) Memory management. (6 marks)

Or

20. Explain the use of queues pipes and mailboxes during the message communication among processes.

[5 × 12 = 60 marks]

G 1324 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electronics and Communication Engineering

EC 010 703—MICROWAVE ENGINEERING (EC)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. What are the features of microwaves ?
2. What are magnetrons ?
3. What is use of PIN diodes ?
4. Define Impedance.
5. What is quality factor ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Why are microwaves significant ?
7. Is generation of microwaves through tubes free of problem ? Explain.
8. Explain the Manly Rowe relations.
9. What are the applications of vector network analyzer ?
10. Write a note on substrate materials.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each question carries 12 *marks.*

11. With relevant sketch, explain the circuit and S parameter representation of microwave network.

Or

12. What are ABCD parameters ? How are they related to S-Y parameters ?

Turn over

13. Explain how microwaves are generated. What are the different approaches ?

Or

14. Explain the basic principle and structure of backward wave oscillator.

15. What are the high frequency limitations of transistors ? How are they overcome ?

Or

16. Explain the working principle and applications of IMPATT and TRAPATT diodes.

17. Explain how directional couples are used to measure return loss with relevant equations and parameters.

Or

18. Write a note on (i) Frequency measurement (ii) Power measurement.

19. Explain the characteristics of planar transmission lines.

Or

20. Compare and contrast monolithic and hybrid MICs.

(5 × 12 = 60 marks)

G 1298 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electronics and Communication Engineering

EC 010 701—VLSI DESIGN (EC)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Mention three thermal oxidation and their oxidation species.
2. Draw the cross-section schematic of an integrated JFET and explain its regions.
3. Compare bipolar technology with CMOS technology.
4. What are the informations conveyed by stick diagrams ?
5. Why GaAs technology is preferred to silicon technology in the fabrication of LED ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Explain dry oxidation. Distinguish between wet oxidation.
7. Compare Dielectric Isolation (DI) and wafer bonding approach for forming SOI.
8. Explain Latch up problem in CMOS fabrication. How to reduce them ?
9. Draw the circuit of BiCMOS inverter.
10. What is MESFET ? How is it different from MOSFT ?

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each question carries 12 *marks.*

11. With neat sketches, explain the optical lithography process, at each step clearly.

Or

12. With neat diagrams, explain (i) Patterning ; (ii) wire bonding ; and (iii) Packaging.

Turn over

13. (a) With necessary diagrams, explain Schottky contacts and their properties. (6 marks)

(b) Explain the shallow trench isolation used for CMOS, with the help of neat sketches. (6 marks)

Or

14. What are IC cross-overs ? How cross-over in IC is managed ? How does bias help in this regard ?

15. Realise the logic diagram of the function $Y = A \oplus B$ using CMOS logic family. Draw its stick diagram and layout for the same.

Or

16. Describe a transmission gate. What are the advantages and disadvantages of using transmission gate for implementing the logic ? Also develop a 2-input CMOS multiplexer using transmission gates.

17. Sketch a D latch circuit using CMOS logic. With respect to a clocked D register, with the help of waveforms define hold time and set up time. Also define clock skew.

Or

18. Describe the circuit of a two-input NAND gate using BiCMOS technology. What are its merits compared to the other logic family types ?

19. (a) Describe a typical PLA architecture. (6 marks)

(b) Explain any two methods of programming a PLA. (6 marks)

Or

20. Draw and explain the structure of a metal gate depletion mode MESFET. Discuss the fabrication steps with necessary sketches.

[5 × 12 = 60 marks]

G 1138 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electronics and Communication Engineering

INFORMATION THEORY AND CODING (L)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Define entropy and mention its properties.
2. Explain the relation among the entropies.
3. Derive expression for channel capacity of Binary symmetric channel.
4. Explain redundancy and efficiency of channels.
5. Explain Kraft's inequality with examples.
6. Suppose that the SNR needed to support a channel with capacity C and brandwidth B is 10. What is the SNR required if B is halved and the same C is maintained ?
7. Define a linear block code. Sketch the block diagram of a (6,3) linear block code.
8. Enumerate the advantages of BCH codes and mention its applications.
9. What is maximum likelihood decoding ?
10. What is interleaved convolutional code ?

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. (a) Give the different properties of entropy of a memoryless source. Prove the external property. (8 marks)

Turn over

(b) A memoryless sources is emitting an independent sequence of 0's and 1's with probabilities p and $(1-p)$ respectively. Plot the entropy of source.

(4 marks)

Or

12. (a) Show that entropy is maximum when source transmits symbols with equal probability. Plot the entropy of this source versus p $(0 < p < 1)$.

(8 marks)

(b) Define mutual information. List its properties. (4 marks)

13. A binary symmetric channel has the following noise matrix with source probabilities of $P(x_1) = \frac{2}{3}, P(x_2) = \frac{1}{3}$.

$$P\left(\frac{Y}{X}\right) = \begin{bmatrix} \frac{3}{4} & \frac{1}{4} \\ \frac{1}{4} & \frac{3}{4} \end{bmatrix}.$$

(i) Determine H (X), H (Y), H (X,Y), H (Y/X), H (X/Y) and I (X,Y).

(ii) Find the channel capacity.

(iii) Find the channel efficiency and redundancy.

Or

14. (a) For a Binary symmetric channel p (0/1) = p (1/0) = 1/3. The channel input consists of four messages, $S_1 = 001$, $S_2 = 010$, $S_3 = 100$, $S_4 = 111$ with probabilities 0.5, 0.25, 0.125 and 0.125 respectively. Then calculate the source probabilities of 0 and 1. Also calculate the efficiency, redundancy and channel capacity.

(8 marks)

(b) Explain the trade-off between bandwidth and SNR. (4 marks)

15. (a) Consider a source with 8 alphabets A to H, with respective probabilities 0.22, 0.20, 0.18, 0.15, 0.09, 0.09, 0.05 and 0.02. Construct a binary Shannon-Fano code and determine its efficiency.

(7 marks)

(b) With an example, explain Ziv coding method. (5 marks)

Or

16. (a) A discrete memoryless source has 5 symbols x_1, x_2, x_3, x_4 and x_5 with probabilities 0.4, 0.19, 0.16, 0.15 and 0.15 respectively attached to every symbol. Construct Huffman code and calculate the code efficiency.

(8 marks)

(b) Staten and explain noiseless coding theorem. (4 marks)

17. (a) What is hamming code ? How many errors it can correct ? Explain with examples.

(4 marks)

(b) Construct a (7,4) cyclic encoder with generator polynominal $g(x) = 1 + X + X^3$. If 1000011 is the received code word, describe how error detection and correction can be done to recover the original data ?

(8 marks)

Or

18. The generator matrix for a (6,3) systematic linear block code is given by :

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}.$$

(i) Find all the code words.

(ii) Find generator and parity check matrix.

(iii) Draw encoding circuit.

(iv) Draw syndrome circuit.

19. Construct rate 1/3, $k = 3$ convolution encoder. $g_1 = [100]$, $g_2 = [101]$, $g_3 = [111]$. Sketch tree diagram and trellis diagram of this encoder.

Or

20. Sketch the code tree and trellis of a (3, 1, 2) feed forward convolution encoder with $G(D) = [1 + D, 1 + D^2, 1 + D + D^2]$ and describe the sequential decoding algorithm.

[5 × 12 = 60 marks]

G 1311 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electronics and Communication Engineering

EC 010 702—INFORMATION THEORY AND CODING (EC)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Define marginal and conditional entropies.
2. State and explain Kraft's inequality.
3. State the two theorems on channel coding.
4. What is a group ? What are the axioms to be satisfied for a group ?
5. What is meant by constraint length and free distance of a convolution code ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Find the channel capacity of the channel with matrix

$$\begin{bmatrix} 1-p & p & o \\ o & 1-p & p \\ p & o & 1-p \end{bmatrix}.$$

7. Explain Huffman coding procedure.
8. Obtain the channel capacity of a binary symmetric channel with conditional probability of error p.
9. What is the minimum distance of a block code and how do you find it ?
10. What are Turbo codes ? With a neat block diagram, explain the working of a Turbo encoder.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

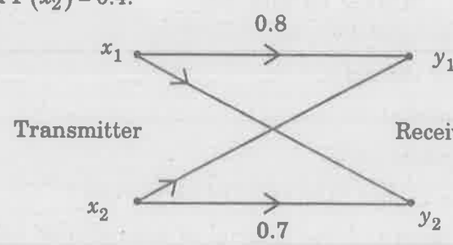
11. (a) A message source produces two independent symbols A and B with probabilities P(A) = 0.4 and P(B) = 0.6. Calculate the efficiency of the source and hence its redundancy. If the symbols are received in average with 4 in every 100 symbols in error, calculate the transmission rate of the system.

(7 marks)

(b) State and prove properties of mutual information. (5 marks)

Or

12. (a) Find the mutual information and channel capacity of the channel shown below if $P(x_1) = 0.6$ and $P(x_2) = 0.4$.



(7 marks)

(b) Explain the concept of amount of information associated with message. What is the reason for using logarithmic measure for measuring the amount of information ?

(5 marks)

13. Encode the following source symbols using Shannon-Fano code and Huffman code :

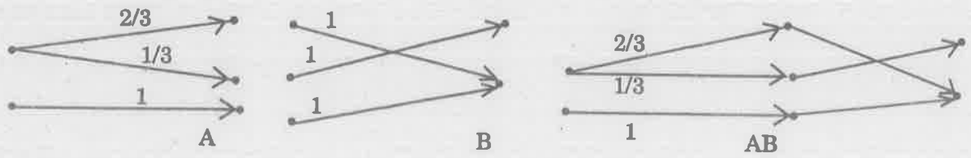
$X = \{x_1, x_2, x_3, x_4, x_5\}$
$P(x) = \{0.2, 0.1, 0.05, 0.05, 0.6\}$.

Find the efficiency of this code in both methods. Compare performance of the coding methods.

Or

14. Describe Shannon-Fano encoding algorithm. Given a source $S = \{S_1, S_2\}$ with probabilities 3/4 and 1/4 respectively. Obtain Shannon-Fano code of 2nd and 3rd extensions of the source. Calculate the efficiency in each case.

15. Consider the channels A, B and the cascaded channel AB shown below :



(i) Find C_A the capacity of channel A.

(ii) Find C_B the capacity of channel B.

(iii) When the two channels are cascaded, determine the combined capacity C_{AB}.

(iv) Explain the relation between C_A, C_B and C_{AB}.

Or

16. (a) Prove that for a finite variance σ^2, the Gaussian random variable has the largest differential entropy attainable by any random variable.

(b) Show that this entropy is given by $\frac{1}{2}\log_2(2\pi e\sigma^2)$.

17. For a symmetric (6, 4) linear block code, the parity matrix P is $P = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 1 \end{bmatrix}$

(i) Find all possible valid code vectors.

(ii) Draw the corresponding encoding circuit.

(iii) Draw the syndrome calculation circuit.

Or

18. (a) Show that $x^5 + x^3 + 1$ is irreducible over GF(2).

(b) Explain the construction of Galois field.

19. Consider the (31, 15) Reed Solomon Code :

(i) How many bits are there in a symbol of the code ?

(ii) What is the block length in bits ?

(iii) What is the minimum distance of the code ?

(iv) How many symbols in error can the code correct ?

Or

20. Consider the (3, 1, 2) convolutional code with $g^{(1)} = (1\ 1\ 0)$, $g^{(2)} = (1\ 0\ 1)$ and $g^{(3)} = (1\ 1\ 1)$. Draw the encoder block diagram. Find the generator matrix. Also, find the code-word corresponding to the information sequence (1 1 1 0 1).

[5 × 12 = 60 marks]

G 1378 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electronics and Communication Engineering

EC 010 706 L03—DIGITAL IMAGE PROCESSING—(Elective)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. List the individual parts in a Digital Image processing system.
2. Give the representation of Hadamard transform for N = 4.
3. What are the roles of smoothing and sharpening filters ?
4. Distinguish between image enhancement and image restoration.
5. What is feedback vector quantization ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. What is quantization ? How is it employed in digitizing an image ?
7. What is DCT ? State and explain their properties, meanings and applications in Image processing.
8. Describe the properties of histogram. Show how contrast stretching is done.
9. Explain image segmentation based on thresholding.
10. Explain the basic principle behind transform coding.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. (a) Describe the importance of brightness, here and saturation in a Digital Image Processing system.

(7 marks)

(b) What is Mach band ? Explain Mach band effect. (5 marks)

Or

Turn over

12. (a) Give the representation of 1D and 2D systems. (3 marks)

(b) Derive the output of a 2D imaging system with input $x(m, n)$ and systems functions H[·].

(9 marks)

13. Prove that an N × N Haar transform matrix is orthogonal and can be implemented in O(N) operations on an N × 1 vector.

Or

14. (a) State and prove 2D convolution theorem. (6 marks)

(b) Define Walsh-Hadamard transforms and represent H_1, H_2 and H_3. (6 marks)

15. With neat block diagram, explain the working of a homomorphic filter and derive its output equation.

Or

16. Describe histogram modelling, histogram specification and equalization methods.

17. Explain the basic formulation for edge based segmentation. Also explain region splitting and merging.

Or

18. Describe the following edge linking methods :—

(i) Curve fitting ; (ii) Hough transform and

(iii) Heuristic search.

(3 × 4 = 12 marks)

19. Generate Arithmetic code for the sequence $a3, a2, a3, a1, a4, a1, \$$ with the following probabilities $p(a1) = 0.3$, $p(a2) = 0.2$, $p(a3) = 0.25$, $p(a4) = 0.15$, $p(\$) = 0.1$.

Or

20. Generate the Huffman code for the sequence $a3, a2, a3, a1, a3, a2, a1, a2, a4$ with the following probabilities $p(a1) = 0.2$, $p(a2) = 0.35$, $p(a3) = 0.3$, $p(a4) = 0.15$ and also calculate the efficiency of the code.

[5 × 12 = 60 marks]