G 5023 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2013

Fourth Semester

Branch : Computer Science and Engineering/Information Technology

CS 10 406/IT 010 404—THEORY OF COMPUTATION (CS, IT)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 3 *marks.*

1. Explain Pigeonhole principle.
2. State pumping lemma and its advantage.
3. Define the language recognized by the push down automata using empty stack.
4. Explain the multitape using machine mode is it more power than the basic turing machine ? Justify your answer.
5. Give two examples of NP-complete problem.

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

6. Discuss about chomsky hierarchy of languages.
7. Design a DFA to accept odd number of a's and even number of b's.
8. Construct a PDA for the language $\left\{ a^n \; b^{2n} \; / n \geq 0 \right\}$.
9. Describe the method of Godelization.
10. Let L be an NP-complete language. Then P = NP if and only if L $\in$ P.

(5 × 5 = 25 marks)

Part C

Answer **either** (*a*) **or** (*b*) *from each question.*
Each question carries 12 *marks.*

11. (a) With an example explain computable and non computable functions.

Or

(b) Briefly explain chomksy classification with an example.

Turn over

12. (a) Design a NFA to recognize the regular expression (0 + 1) (0 + 1) * (0 + 1) using Thomson construction algorithm and convert to an equivalent minimized DFA. Trace for a string $w = 0001$.

Or

(b) Briefly explain any three applications of finite automata in detail.

13. (a) (i) Explain about Greibach Normal Form. (4 marks)

(ii) Is L = $\{a^n b^n c^n / n >= 1\}$ a context free language ? Justify your answer. (8 marks)

Or

(b) For the grammar S $\rightarrow$ aABC, A $\rightarrow$ aB/a B $\rightarrow$ bA/b C $\rightarrow$ a. Obtain the corresponding PDA. Trace for the string $w = aabaa$.

14. (a) Construct a TM that finds the difference of two natural numbers.

Or

(b) Explain the post correspondence Problem with an example.

15. (a) Prove that subgraph isomorphism problem in NP complete.

Or

(b) (i) How is Time complexity and space complexity defined in NP and P problems ?

(ii) Is P = NP an undecidable problem.

[5 × 12 = 60 marks]

G 4994 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2013

Fourth Semester

Branch : Computer Science Engineering/Information Technology

CS 010 403/IT 010 405—DATA STRUCTURES AND ALGORITHMS (CS, IT)

(New Scheme — Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 3 *marks.*

1. What is meant by Folding?
2. Define a Stack.
3. State the advantages, disadvantages of linked lists.
4. Define a binary tree and a binary search tree.
5. What are the factors to be considered while choosing a sorting technique?

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

6. Explain the system life cycle.
7. Explain in detail the Push and POP operation in a stack.
8. Explain the process of polynomial addition in linked lists.
9. State the merits and demerits of linked representation of a binary tree.
10. Explain in quick sort algorithm.

(5 × 5 = 25 marks)

Part C

Each question carries 12 *marks.*

11. Explain in different types of Hashing techniques.

Or

12. Explain in Collision resolution techniques.

Turn over

13. Explain priority queues in detail.

Or

14. Explain Towers of Hanoi problem in detail.

15. Explain in brief the traversal of nodes in a circular doubly linked list.

Or

16. Explain in brief deletion nodes in various positions in a circular singly linked list.

17. What is meant by binary tree traversal? What are the different traversal techniques?

Or

18. Discuss a non-recursive algorithm to perform inorder traversal of a binary tree.

19. Explain the bubbles sort and insertion sort alrorithm.

Or

20. What is meant by External Sorting? Explain in external sorting technique.

(5 × 12 = 60 marks)

G 5005

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

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2013

Fourth Semester

Branch : Information Technology

IT 010 403—COMPUTER ORGANIZATION AND ARCHITECTURE (IT)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What are the three types of channel usually found in large computers ?
2. Explain the operations of a control unit.
3. What is memory interleaving ?
4. Distinguish synchronous bus and asynchronous bus.
5. What are issues to handle deadlock ?

(5 × 3 = 15 marks)

Part B

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

6. Compare RISC with CISC architecture.
7. Briefly describe the design of a hardwired control unit.
8. Describe the role of cache memory in pipelined system.
9. What is the importance of EFO interface ? Compare the features of SCSI and PCI interfaces.
10. Explain design issues of pipeline architecture.

(5 × 5 = 25 marks)

Part C

Answer **either** (*a*) **or** (*b*) *section of each module.*
Each question carries 12 *marks.*

11. (a) Briefly explain Addressing modes.

Or

(b) Write a short notes on :

(i) Machine level programming.

(ii) Assembly level programming.

Turn over

12. (a) Draw and explain instruction cycle.

Or

(b) Explain the basic organization of a microprogrammed control unit and the generation of control signals using micro-program.

13. (a) With necessary illustrations explain different cache memory mapping techniques.

Or

(b) What is virtual memory and what are the benefits of visual memory explain in detail.

14. (a) Explain the DMA drivers data transfer techniques.

Or

(b) Discuss the operation of any *two* input devices.

15. (a) Briefly explain Instruction level parallelism.

Or

(b) Explain Flynn taxonomy of parallel processor.

(5 × 12 = 60 marks)

G 5017 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2013

Fourth Semester

Branch : Information Technology

IT 010 045—OBJECT ORIENTED TECHNIQUES (IT)

(New Scheme — Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 3 *marks.*

1. Define : Object Oriented Programming.
2. Define : Class.
3. What is Java Interpreter?
4. What are Packages and why ? How to execute a program in a package ?
5. Which containers use a flow layout as their default layout?

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

6. What is difference between overloading and overriding?
7. Explain briefly in Template.
8. Write down the merits and demerits and application of Java.
9. What is thread and multithread? How is thread created?
10. What is meant by controls and what are different types of controls in AWT?

(5 × 5 = 25 marks)

Part C

Each question carries 12 *marks.*

11. Explain the basic elements of object oriented programming. (12 marks)

Or

12. Write a C++ program using inline function. (12 marks)

Turn over

13. Explain about copy constructor with an example. (12 marks)

Or

14. Write a program for overloading the assignment operators. (12 marks)

15. In detail explain inner classes. (12 marks)

Or

16. Explain about in Java :

    (a) Java class. (6 marks)

    (b) Java object. (6 marks)

17. Describe package concept to perform arithmetic operations. Explain how to use it. (12 marks)

Or

18. In detail, explain multithreading in Java with a suitable example. (12 marks)

19. Give a explanatory answer to define the difference between Java and C++. (12 marks)

Or

20. In detail explain, in the following :

    (a) Event listener. (6 marks)

    (b) Adapter classes. (6 marks)

[5 × 12 = 60 marks]

G 4980 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2013

Fourth Semester

Branch : Information Technology

OBJECT ORIENTED PROGRAMMING IN C++ (T)

(Old Scheme—Supplementary/Mercy Chance)

Time : Three Hours Maximum : 100 Marks

Write neat and efficient C++ programs wherever needed.

Part A

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

1. What is a scope resolution operator ? What are its uses ?
2. Draw a flow diagram to show the logic of program flow in an else statement.
3. Write function prototypes for the following library functions :
   (i) sqrt ( ) (ii) fabs ( )
   (iii) isalpha ( ) (iv) exit ( ).
4. Write the rules for declaring a structure.
5. How we can create the array of a class object ?
6. Explain the keywords private and public and their use in OOP.
7. How will you declare a derived class with multiple inheritance ?
8. Show how to define an overloaded operator function.
9. What are the differences between function templates and class templates ?
10. For exception handling what types of functions are available in C++ ?

(10 × 4 = 40 marks)

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. Write, using "Switch", a program which reads a number between 1 and 7 and prints the day corresponding to the number (ie, 1 → Sunday, 2 → Monday, 3 → Tuesday ... 7 → Saturday).

Or

12. A newspaper boy purchases 100 papers everyday. He purchases paper at Rs. 2.50 and sells them at Rs. 3.00 each. He sells any unsold newspaper as scrap at a price of Re. 0.50. Write a C++ program to read the demand on a given data and evaluate his profit.

MODULE 2

13. Write a program to read an integer number and display the product of the same with all natural numbers 2 through 9.

Or

14. Design a structure named TIME to store the hours, minutes and seconds associated with the time. Hence write a program to read two times and add them.

MODULE 3

15. Define a class with three integer data members. Provide member functions to read and display them. Modify the class defined by adding a constructor to initialize objects.

Or

16. Write a program by oop approach which calculates the factorial of a number using constructor and destructor member functions.

MODULE 4

17. Write program examples, discuss how :

    (i) arithmetic operator overloading.

    (ii) assignment operator overloading is done in C++ ?

Or

18. Define a class to store the following information about an element :

    (i) Symbol (maximum of two characters)

    (ii) atomic number (integer number)

    (iii) atomic weight (real number).

    Member functions are required for reading the information and displaying the information about an element. Create a derived class to store the following additional information :

    (i) number of protons and

    (ii) number of neutrons.

MODULE 5

19. Write a function which divides one number by another and raise exception if there is division by zero condition. Call that within try block.

Or

20. What are virtual destructors ? Write a program example, indicating its application.

(5 × 12 = 60 marks)

G 4942 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2013

Fourth Semester

Branch : Information Technology

DATA STRUCTURES AND ALGORITHMS (T)

(Old Scheme – Supplementary/Mercy Chance)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 4 *marks.*

1. What is meant by time complexity of an algorithm? What is its significance?
2. What is a priority queue? Mention an application of priority queue.
3. Write an algorithm to reverse a singly linked list using only one pass through the list.
4. Write algorithms to perform enqueue and dequeue operations on a linked queue.
5. Write an algorithm that checks whether a Binary tree is a Binary Search tree.
6. What are AVL trees? Give an example.
7. Give the non-recursive algorithm for Breadth First search on graphs.
8. Explain Dynamic memory management.
9. What is a heap? Explain the properties of a heap.
10. Explain Interpolation search.

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*

Each question carries 12 *marks.*

11. What are sparse matrices? Write an algorithm to add two sparse matrices.

Or

12. Write an algorithm to reverse the elements on a stack which is represented as array using :
    (a) Two additional stacks.
    (b) One additional stack.

Turn over

13. Write a function to merge two ordered singly linked lists of integers into one ordered list.

Or

14. Write and explain the algorithm to add two polynomials represented as linked lists.

15. Write an algorithm to construct the Binary tree with a given inorder and postorder traversal.

Or

16. Write an algorithm to count the number of leaf nodes in a Binary tree. What is its computing time?

17. Apply Depth First Search and Breadth First Search to the complete graph with 4 vertices. List the vertices in the order they would be visited.

Or

18. What is hashing? Explain the various techniques for resolving collision in hashing.

19. Explain Heap sort algorithm with an example. Draw all the intermediate heaps formed. What is its time complexity?

Or

20. Give an algorithm for linear search. Derive its best, average and worst case time complexities.

(5 × 12 = 60 marks)

G 4952 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2013

Fourth Semester

Branch : Information Technology

LINEAR INTEGRATED CIRCUITS AND APPLICATIONS (T)

(Old Scheme—Supplementary/Mercy Chance)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What is a level shifter ? Where it is used ? What is its significance ?
2. A square wave of peak-to-peak amplitude of 750 m V is to be amplified to a peak-to-peak amplitude of 3.8 V with a rise time of 4.5 μ sec. *or* less. Can IC 741 OP-amp be used ?
3. Define Q of a BPF. If f_o is increased keeping BW constant, will be Q change ? How ?
4. Compare and contrast the frequency responses of Butterworth and Chebyshev filters.
5. An 8 bit successive approximation ADC has a resolution of 20 mV. If the analog input is 2.17 volt, calculate the digital output.
6. A 6-bit DAC uses binary weighted resistors. If the MSB resistor is 10 kΩ, what is the value of LSB resistor ?
7. What are dual power supplies ? What are their advantages ?
8. Explain the need of fold back current limiting with its regulation curve characteristics ?
9. List any *four* applications of a PLL.
10. Explain the role of the low pass filter in PLL.

(10 × 4 = 40 marks)

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) What is active load ? Why it is used in the OP-amp circuit ? (4 marks)

    (b) The two input terminals of an OP-amp are connected to voltage signals of strength 735 μ V and 730 μ V respectively. The gain of the op-amp in differential mode is 5×10^5 and its CMRR is 80 dB. Calculate the output voltage and percentage error due to common mode.

(8 marks)

Or

Turn over

12. With circuit diagrams, explain the OP-amp connected as
    (a) Inverter.
    (b) Scale changer and
    (c) Phase changer.
    Give their design equations.

Module 2

13. Draw the circuit diagram of an op-amp astable multivibrator which uses a regenerative comparator, a resistor and a capacitor. Explain the working with necessary waveforms. If the period of this circuit is to be doubled, what should be the new value of the resistance ?

Or

14. With a neat circuit diagram, describe an active narrow band pass filter. Explain the design equations and show the frequency response plot.

Module 3

15. With necessary diagrams, explain the working of an 8-bit successive approximation ADC.

Or

16. (a) With necessary diagrams, explain how an analog multiplier is constructed ?
    (b) A 12-bit DAC has a step size of 4 mV. Find the full scale output and resolution.

Module 4

17. Draw and explain the circuit diagram of a dual tracking regulator. What are its advantages ?

Or

18. With a fundamental block diagram of the internal functional units, explain how a 3-pin regular chip can output constant voltage ? Draw the complete circuit diagram of +15 Volt power supply, starting from a.c. mains input.

Module 5

19. With the help of circuit diagram, explain how a PLL can be used as a frequency synthesiser ? Draw the circuit of a PLL which can multiply an input 1.5 kHz by a factor of 6.

Or

20. Draw and describe the internal functional block diagram of the I.C. power amplifier. Show its connection diagram.

[5 × 12 = 60 marks]

G 4962 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2013

Fourth Semester

Branch : Information Technology

COMPUTER SYSTEMS ARCHITECTURE—(T)

(Old Scheme—Supplementary/Mercy Chance)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Describe the different control and status signals of 8085.
2. Discuss the merits and demerits of register direct addressing, with suitable examples.
3. Define T-state machine cycle and instruction cycle.
4. Discuss how stack will be affected by the following instructions :
   (a) PUSH. (b) POP.
5. Explain restoring division operation with an example.
6. What is microprogramming ? List the merits and demerits.
7. Explain two techniques to reduce cache miss penalty.
8. What is memory hierarchy ? What are its advantages ?
9. Distinguish between synchronous and asynchronous bus systems.
10. Explain the DMA data transfer between I/O and memory.

(10 × 4 = 40 marks)

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. Draw the functional block diagram of a digital computer and describe each block giving appropriate examples. Show how the data, control flows occur ?

Or

12. (a) With a timing diagram, explain the various phases during an instruction cycle related with the instruction MOV A, C. (6 marks)
    (b) With a neat diagram, explain how 8085 is interfaced with a typical RAM chip. (6 marks)

Turn over

Module 2

13. (a) How the branch operations are classified ? Explain with examples. (6 marks)

(b) Describe the indirect addressing schemes of 8085 with appropriate examples. (6 marks)

Or

14. (a) Explain machine control instructions ? (4 marks)

(b) Describe the immediate addressing procedure for 8085 with necessary examples. (8 marks)

Module 3

15. Explain Booth's algorithm to multiply two numbers. Using this algorithm, multiply 12 X (– 15).

Or

16. Explain the strategy of micro instructions for control.

Module 4

17. What is TLB ? Explain how it helps in faster address translation.

Or

18. (a) With neat block diagram, explain how the performance of memory can be improved in interleaved organization of multiple memory modules ? (8 marks)

(b) Explain with figure, read and write operations in a dynamic memory cell. (4 marks)

Module 5

19. (a) Clearly explain the differences in different cycle stealing modes of operation—halt and restart, cycle stretching and transparent. (6 marks)

(b) Make a comparative study of the three different modes of I/O transfer–DMA, programmed and interrupt I/O. (6 marks)

Or

20. (a) With a suitable illustration, describe the scheme of vectored interrupt multiple interrupting devices. (6 marks)

(b) Describe the relative advantages and disadvantages of various bus arbitration schemes. (6 marks)

[5 × 12 = 60 marks]

20 (i) Fit a normal curve and test the goodness of fit for :

x :	0	1	2	3	4	5	6	7	8
f :	2	4	10	15	19	12	8	7	1

(6 marks)

(ii) Test if the means are significantly different :

	Size	*Mean*	S.D.
Sample 1 :	5	11.4	2.65
Sample 2 :	7	14.4	4.37

(6 marks)

[5 × 12 = 60 marks]

G 4984 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2013

Fourth Semester

EN 010 401—ENGINEERING MATHEMATICS—III

(Regular/Improvement/Supplementary—New Scheme)

[Common for all Branches]

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 3 *marks.*

1. Find a_0 from $f(x) = \begin{cases} -\pi, & \text{if } -\pi < x < 0 \\ x, & \text{if } 0 < x < \pi. \end{cases}$

2. Find the Fourier cosine transform of $f(x) = \begin{cases} 1, & 0 < x < 1 \\ 0, & x \geq 1. \end{cases}$

3. Solve $zp = -x$.

4. Find E (x) from

x :	0	1	2	3
$p(x)$:	·1	·2	·4	·3

5. What do you mean by Hypothesis ? Write its types.

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

6. Obtain Fourier expansion for $\sin ax$ in the interval $-l < x < l$.

7. Find the Fourier cosine transform of $x e^{-ax}$.

8. Form a partial differential equation by eliminating the arbitrary function ϕ from $\phi\left(x + y + z, x^2 + y^2 - z^2\right) = 0$.

9. Derive the mean of binomial distribution.

10. Write the working rule for testing the hypothesis ?

(5 × 5 = 25 marks)

Turn over

Part C

Each full question carries 12 marks.

11. (i) If $f(x) = \sqrt{1-\cos x}$, $0 \le x \le 2\pi$. Obtain the Fourier expansion and hence deduce that

$$\sum_{n=1}^{\infty} \frac{1}{4n^2-1} = \frac{1}{2}.$$

(8 marks)

(ii) Prove that for values of x in the range $(-\pi, \pi)$

$$\frac{1}{2}x = \sin x - \frac{\sin 2x}{2} + \frac{\sin 3x}{3} - \ldots\ldots$$

(4 marks)

Or

12. (i) Obtain the Fourier series expansion for $f(x) = \begin{cases} x + \pi/2, & -\pi < x \le 0 \\ \pi/2 - x, & 0 \le x < \pi. \end{cases}$ (6 marks)

(ii) Prove that in the interval $-\pi < x < \pi$, $x \cos x = -\frac{1}{2}\sin x + 2\sum_{n=2}^{\infty} \frac{n(-1)^n}{n^2-1} \sin nx$.

(6 marks)

13. Find the Fourier transform of $f(x) = \begin{cases} a - |x|, & |x| \le a \\ 0, & |x| > a > 0. \end{cases}$ (12 marks)

Or

14. (i) Evaluate $\int_0^{\infty} \frac{dx}{\left(x^2+a^2\right)^2}$ using Parseval's identity. (6 marks)

(ii) Find the Fourier Cosine transform of $f(x) = e^{-ax}, a > 0$. (6 marks)

15. (i) Solve : $\left(D^2 - 2DD' + D'^2\right) z = \tan(y+x)$. (6 marks)

(ii) Solve : $\left(D^2 - 2aDD' + a^2 D'^2\right) z = f(y+ax)$. (6 marks)

Or

16. (i) Solve : $\left(D^2 - D'\right) z = xe^{ax} + a^2 y$. (6 marks)

(ii) Solve : $(D - 3D' - 2)^2 z = 2e^{2x} \tan(y + 3x)$. (6 marks)

17. Find the variance of : $f(x) = \begin{cases} \frac{1}{16}(x+3)^2, & -3 \le x < -1 \\ \frac{1}{16}\left(6 - 2x^2\right), & -1 \le x < 1 \\ \frac{(3-x)^2}{16}, & 1 \le x \le 3. \end{cases}$ (12 marks)

Or

18. (i) Fit a normal distribution for :

x :	1	3	5	7	9
f :	1	2	3	2	1

(6 marks)

(ii) There are 2 urns containing 4 white 6 Red and 15 black balls and 10 white 8 red and 12 black balls respectively. One ball is taken out from each urn. What is the probability that both are red ?

(6 marks)

19. (i) Test if the means are significantly different for

	n	*mean*	*S.D*
gp 1 :	50	181.5	3.0
gp 2 :	75	179	3.6

(6 marks)

(ii) Comment on the following :

Mathematical ability		*General ability* *Good*	*Fair*	*Poor*
GOOD	:	44	22	5
Fair	:	265	257	178
Poor	:	41	91	98

(6 marks)

Or

G 4936 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2013

Fourth Semester

Engineering Mathematics—III (CMELRPTANSUF)

(Old Scheme—Supplementary/Mercy Chance)

Time : Three Hours Maximum : 100 Marks

Answer **one** *full question from each module.*
Each full question carries 20 *marks.*
Use of statistical tables is permitted.

MODULE 1

1. (a) Solve $\frac{d^2y}{dt^2} - 3\frac{dy}{dt} + 2y = 0$, given that when $t = 0$, $y = 0$ and $\frac{dy}{dt} = 0$. (5 marks)

(b) $2(y + z)\,dx - (x + z)\,dy + (2y - x + z)\,dz = 0$. (5 marks)

(c) A particle of mass 4 gram vibrates through one centimeter on each side of the middle point of its making 330 complete vibrations per minute. Assuming its motion to be SHM, show that the maximum force upon the particle is $484\pi^2$ dyne. (10 marks)

Or

2. (a) Solve $(D^3 - 6D^2 + 11D - 6)\,y = e^{-2x} + e^{-3x}$. (6 marks)

(b) Solve $\frac{dx}{dt} + 5x - 2y = t$, $\frac{dy}{dt} + 2x + y = 0$; given that $x = y = 0$ when $t = 0$. (8 marks)

(c) Solve by the method of variation of parameters $y'' - 2y' + y = e^x \log x$. (6 marks)

MODULE 2

3. (a) Form partial differential equation by eliminating the arbitrary functions

$$z = f(x + ay) + g(x - ay).$$

(5 marks)

(b) Solve $pz - qz = z^2 + (x + y)^2$. (5 marks)

(c) A bar 10 cm. long, with insulated sides, having its ends A and B maintained at temperatures 50° C. and 100° C. respectively, until steady-state conditions prevail. The temperature at A is suddenly raised to 90° C. and at the same time that at B is lowered to 60° C. FInd the temperature distribution in the bar at time t. (10 marks)

Or

Turn over

4. (a) Solve by Charpit's method $(p^2 + q^2)\, y = qz$. (10 marks)

(b) Solve $\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial x\, \partial y} + \frac{\partial^2 z}{\partial y^2} = x^2 + xy + y^2$. (10 marks)

MODULE 3

5. (a) Find the Fourier sine and cosine transforms of $f(x) = \begin{cases} 1, & 0 \le x < a \\ 0, & x \ge a \end{cases}$. (12 marks)

(b) Solve the integral equation $\int_0^\infty f(x) \cos \lambda x\, dx = e^{-\lambda}$. (8 marks)

Or

6. (a) Express $f(x) = \begin{cases} 1, & 0 \le x < \pi \\ 0, & x \ge \pi \end{cases}$ as a Fourier sine integral and hence evaluate

$$\int_0^\infty \frac{1 - \cos \pi\lambda}{\lambda} \sin \lambda x\, d\lambda.$$

(10 marks)

(b) Find the Fourier Sine Transform of e^{-ax} and hence find the Fourier Sine Transform of $\frac{x}{x^2 + a^2}$.

(10 marks)

MODULE 4

7. (a) The following data are the number of seeds germinating out of 10 on damp filter for 80 sets of seeds. Fit a binomial distribution to this data :

x :	0	1	2	3	4	5	6	7	8	9	10	Total
f :	5	18	22	10	8	8	7	2	0	0	0	80

(10 marks)

(b) The incidence of occupational disease in an industry is such that the workmen have a 10% chance of suffering from it. What is the probability that in a group of 8, six or more will suffer from it ?

(10 marks)

Or

8. (a) It is known from the past experience that the number of telephone calls made daily in a certain community between 4 p.m. and 5 p.m. have a mean of 350 and a standard deviation of 30. What percentage of the time will there be more than 400 telephone calls made in this community between 4 p.m. and 5 p.m.?

(10 marks)

(b) The probability that a man aged 45 years will die before reaching the age of 50 years may be taken as 0.019. Out of a group of 500 men, now aged 45 years, what is the probability that 2 men will die within the next 5 years?

(10 marks)

MODULE 5

9. (a) Two random samples are drawn from two normal populations, gave the following results :

Sample 1 :	20	17	25	29	24	20	18	19
Sample 2 :	19	21	18	17	27	26	25	19

Test whether the two samples have the same variance at 5% of level of significance.

(10 marks)

(b) A set of 5 similar coins is tossed 320 times and the result is :

No. of heads :	0	1	2	3	4	5
Frequency :	5	28	75	115	68	31

Test the hypothesis that the data follow a Binomial distribution for V = 5, $\chi^2_{0.05} = 11.07$.

(10 marks)

Or

10. (a) If the mean of an infinite population is 550 with standard deviation 8.1, how large a sample must be used in order that there be one chance in 100 that the mean of the sample is less than 547?

(10 marks)

(b) The standard deviation calculated from two random samples of sizes 9 and 13 are 2.1 and 1.8 respectively. May the samples be regrated as drawn from normal populations with the same standard deviation?

(10 marks)

[5 × 20 = 100 marks]

(b) Find the autocorrelation of the following signals (i) $x_1(n) = \underset{\downarrow}{(4}, 3, 2, 1)$ (ii) $x_2(n) = u(n)$.

(6 marks)

Or

20. (a) Obtain the cross correlation of the following signals $x_1(t) = \sin(4\pi t)$ and $x_2(t) = \cos(4\pi t)$.

(4 marks)

(b) By direct computational method, obtain the cross correlation of the following sequences

$x_1(n) = [\underset{\uparrow}{2}, 3, 4]$ and $x_2(n) = [1, \underset{\uparrow}{2}, 3]$.

(8 marks)

[5 × 12 = 60 marks]

G 4970

(Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2013

Fourth Semester

Branch : Electronics and Communication/Applied Electronics and Instrumentation / Electronics and Instrumentation/Information Technology

SIGNALS AND SYSTEMS (L A S T)

(Old Scheme—Supplementary/Mercy Chance)

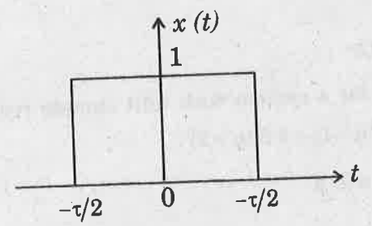
Time : Three Hours Maximum : 100 Marks

Missing data, if any may be suitably assumed.

Part A

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

1. How do you define time invariance property of a continuous time system ? Explain with an example.
2. A system is described by the input-output characteristics $y[n] = x[-n]$. Check if its is (i) stabe ; (ii) Causal.
3. Find the Fourier transform of the gate function shown below :



4. State and explain any two properties of CTFT ?
5. Find the discrete Fourier series representation of a periodic sequence $x(n) = \{1, 1, 0, 0\}$ with period N = 4.
6. Find the frequency response of the LTI system $h(t) = -\delta(t+1) + \delta(t) - \delta(t-1)$.
7. Find the system function, H (z) and unit-sample response $h(n)$ of the system whose difference equation is $y(n) = -\frac{1}{2} y(n-1) + 2x(n)$.

8. Determine the impulse response of $H(s) = \dfrac{2s-1}{s^2+3s+2}$.

9. Determine the energy spectral density and hence energy contents of the signal $x(t) = \sin c(t)$.

10. Find autocorrelation function and power spectral density of signal $x(t) = 10 \sin(w, t+\tau)$ where $w_1 = \dfrac{2\pi}{T}$.

(10 × 4 = 40 marks)

Part B

Answer any one **full** *question from each module.*
Each full question carries 12 *marks.*

Module 1

11. Find the natural and total response of the system described by the differential equation :

$$\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = \frac{dx(t)}{dt} + 2x(t).$$

where $x(t) = e^{-t}u(t)$ and $y(0^+) = 2, \dfrac{d}{dt}y(0^+) = 3$.

Or

12. Find the output $y(n)$ for $n = 1, 2, \ldots .6$ for a system with unit sample response $h(n) = 2^{-n}u(n)$ and whose input is $x(n) = 2\delta(n) + 4\delta(n-1) + 4\delta(n-2)$.

Module 2

13. (a) Find the Fourier series coefficients of the periodic signal $x(t) = \begin{cases} 1, & |t| < T_1 \\ 0, & T_1 < |t| < \dfrac{T}{2} \end{cases}$ (6 marks)

(b) Find the energy spectral density of the signal $x(t) = \begin{cases} e^{-2t}, & t \geq 0 \\ 0, & t < 0 \end{cases}$ (6 marks)

Or

14. Derive Parseval's theorem. Using the same find the energy of the signal $x(t) = e^{-at}u(t)$ and also energy in the frequency band $|w| \leq 0.5$ rad /sec.

Module 3

15. (a) Consider a system described by the differential equation $y(n) - 0.6\,y(n-1) = x(n) = (0.4)^n$, $n \geq 0$, $y(-1) = 10$. Find the solution using prescribed initial conditions. (6 marks)

(b) Find the discrete time Fourier coefficients for

$$x(n)\,1 + \cos\left(\frac{2\pi}{N}\right)n + 2\cos\left(\frac{4\pi n}{N} + \frac{\pi}{3}\right) + 4\cos\left(\frac{6\pi n}{N} + \frac{\pi}{4}\right).$$

(6 marks)

Or

16. (a) Find the natural response for $y(n) + 0.1\,y(n-1) - 0.3\;\; y(n-2) = 2u(n)$, given $y(-1) = 0, y(-2) = 0$. (6 marks)

(b) Find the inverse DTFT of the system $X\left(e^{j\Omega}\right) = \dfrac{\left(\frac{2}{3}\right)e^{-j\Omega} + 5}{1 + \left(\frac{5}{6}\right)e^{-j\Omega} + \left(\frac{1}{6}\right)e^{-2j\Omega}}$. (6 marks)

Module 4

17. Find the inverse z-transform of $X(z) = \dfrac{1}{1 - 1.5\,z^{-1} + 0.5\,z^{-2}}$ using power series expansion method for $|z| > 1$ and $|z| < 1$.

Or

18. A continuous time LTI system is initially relaxed and is represented by the equation $y''(t) + 3y'(t) + 2y(t) = 2x(t)$. Using Laplace Transforms,

(a) Determine transfer function of the system. (3 marks)

(b) Determine impulse response of the system. (4 marks)

(c) Find response of the system to an input $x(t) = 4e^{-3t}u(t)$. (5 marks)

Module 5

19. (a) Define PSD. Find the PSD for $x(t) = A\cos(2\pi f_c t)$ and hence find the average power of the signal $x(t)$.

(6 marks)