F 9329 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fourth Semester

Branch : Information Technology

DATA STRUCTURES AND ALGORITHMS (T)

(2002 Admissions onwards—Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What is meant by Algorithm ? Explain why do we analyze algorithms.
2. Transform each of the following expressions to Postfix and Prefix ('$' represents exponentiation).
   (a) (A + B) * (C – D) $ E * F.
   (b) (A + B)* (C $ (D – E) + F) – G.
3. Compare Singly linked list and Doubly linked list.
4. Write a function/Algorithm to perform PUSH operation in a stack using linked list.
5. How can we represent binary tree using array ? Give an example.
6. Draw Binary tree from Preorder and Inorder traversal.

   Preorder ABDHECFG

   Inorder DHBEAFCG
7. Discuss about 2 ways of representing graph.
8. Explain briefly about Compaction and Garbage collection.
9. Give the trace of insertion sort algorithm for the input : 9 8 7 6 5 4 3 2 1.
10. Compare linear search and binary search. Give the complexity of each algorithm.

(10 × 4 = 40 marks)

Part B

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

11. Give an algorithm for sequential search. Derive best, average and worst case time complexity.

Or

12. Give an algorithm to convert an Infix expression to Postfix expression.

Turn over

13. Give function/Algorithm to perform following n Singly linked list :

    (a) To insert an element into a sorted list.

    (b) To find an element whose value is X.

Or

14. Implement Circular Queue using linked list.

15. What is meant by BST ? Give algorithm for insertion and deletion of an element from BST.

Or

16. Give the algorithm for creation and different traversal of binary tree.

17. Give BFS algorithm. Explain the same with an example.

Or

18. What is meant by collision in hashing ? Explain different methods to resolve collision with appropriate examples.

19. Give selection sort algorithm. Compare with bubble sort Algorithm ? When selection sort is preferred over bubble sort ? Discuss its time complexity.

Or

20. Give Quick sort algorithm. Show all passes using quick sort with following list :

    27, 13, 43, 78, 42, 198, 34, 75, 35, 71, 17. Prove that worst case time complexity of quick sort algorithm is $O(n^2)$.

(5 × 12 = 60 marks)

F 9339 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fourth Semester

Branch—Information Technology

LINEAR INTEGRATED CIRCUITS AND APPLICATIONS (T)

(2002 Admissions onwards—Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Draw the equivalent circuit of an op-amp and comment on the parameter value.
2. If the output of an op-amp varies from +1 V to –10 V in 3 sec, calculate the slew rate.
3. Why the gain of the first order LPF decreases at 20dB/ decade rate ? Derive the same.
4. A second order high pass Butterworth filter has $C_1 = C_2 = 0.04\mu F$, $R_1 = R_2 = 3.3\,K$, $R_F = 15.8\,K$, $R' = 27K$. Calculate their lower cut-off frequency.
5. A 4 bit DAC has a maximum precision supply voltage of 15V. What is the voltage change for each LSB ?
6. In a dual slope ADC, a 3½ digit BCD counter is used and the signal is integrated until the two most significant bits of the counter are 1. What is the decimal count ?
7. With a circuit diagram, explain the principle ofcurrent limiting in a voltage regulator circuit.
8. A voltage regulator experiences a 14 mV change in output voltage when the load current increases from 0 to 100 mA. Determine the load regulation rating of the circuit.
9. With a block schematic, explain the principle of PLL.
10. Compare and contrast lock range and capture range. How they can be varied ?

(10 × 4 = 40 marks)

Part B

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

Module 1

11. (a) With a circuit diagram, describe how the slew rate is determined. Derive the equation used ?
    (b) Compare any six properties of an ideal and practical op-a.m.p. giving their values.

Or

Turn over

12. (a) In a non-inverting floating load V-I converter, V_{in} = 5V, R = 10 K, V_{sat} = 13 V. Find i_o and the maximum permissible value of R_L.

(b) With neat circuit diagram and waveforms describe the working of a precision half wave rectifier.

Module 2

13. Draw the circuit of a Notch active filter and derive the expression for its Notch frequency.

Or

14. With a neat circuit and waveform, describe the working of an op-amp Monostable multivibrator. Derive expression for its pulse width.

Module 3

15. With a neat circuit diagram, explain the working of an 8 bit flash converter ? List its merits.

Or

16. Draw the necessary waveforms and explain the working principle of a dual-slope integrating type ADC. Describe the necessary expression for accumulated counts.

Module 4

17. Draw the circuit diagram of a fold back voltage regulator using 723 IC, for an output voltage of 10V, I_{max} = 100 mA, I_{sc} = 15 mA. Design and explain the circuit.

Or

18. With a neat circuit diagram, explain the working of a series pass voltage regulator having feedback and overcurrent protection.

Module 5

19. List three applications of PLL. With the help of neat circuit diagrams, explain them.

Or

20. Draw the internal diagram of 8038. Explain how the sine, square and triangular waves are generated.

(5 × 12 = 60 marks)

F 9349 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fourth Semester

Branch : Information Technology

COMPUTER SYSTEMS ARCHITECTURE (T)

(2002 Admission onwards—Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What is an interrupt ? What are its applications ?
2. List the classification of instructions based on addressing modes and give one instruction as an example for each.
3. Explain the different control and status signals of 8085 ?
4. What are machine control instructions ? Explain with an example.
5. Explain carry save adder ?
6. Draw the hardwired control circuit for fetch operation.
7. Explain the functions of virtual memory ?
8. What is the role of Cache memory in improving system performance ? Explain.
9. Explain DMA operations ?
10. Explain where serial and where parallel communication are preferred ?

(10 × 4 = 40 marks)

Part B

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

Module 1

11. (a) With a neat block diagram, explain clearly the layered view of a computer system.

Or

(b) Draw the internal architecture of Intel 8085 and clearly explain the function of each block ?

Turn over

Module 2

12. (a) (i) Compare and contrast between immediate and implicit addressing ? (4 marks)

(ii) Explain the following instructions of 8085 and indicate the status of different flags :

(1) ADI (2) CMA (3) RAR

(8 marks)

Or

(b) What is stack ? Describe the various stack instructions and their functioning ?

Module 3

13. (a) What is microprogramming ? Illustrate a vertical micro instruction format for soft microprogramming and explain its control fields.

Or

(b) Explain any one multiplication algorithm which can be implemented as hardware and perform 8×5 using the same algorithm.

Module 4

14. (a) What are the advantages of virtual memory ? Explain in detail, giving one example how you can map a virtual address to physical address ?

Or

(b) What is working principle of Cache memory ? With a flow chart expalin the read/write operation in a system equipped with Cache memory ?

Module 5

15. (a) Describe the synchronous and asynchromonus data transfer schemes with the associated control signals ?

Or

(b) With neat diagrams describe various schemes for resolving priority of interrupts from multiple I/O devices.

($5 \times 12 = 60$ marks)

F 9367 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fourth Semester

Branch : Information Technology

OBJECT ORIENTED PROGRAMMING IN C++ (T)

(2002 Admissions onwards–Supplementary)

Time : Three Hours Maximum : 100 Marks

Write neat and efficient C++ programs whereever needed.

Part A

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

1. How many ways a variable can be initialised into ? Give examples for each of initialization.
2. Write a "while" loop that displays the numbers 2, 4, 6, 8, 10, ... 28, 30.
3. What are the differences between passing parameters by value and by reference ?
4. When do we need to use default arguments in a function ? Give an example.
5. How is a member function of a class defined ? Give its application.
6. What is a constructor ? List the properties of the constructor functions.
7. What do you mean by overloading of a function ? When do we use this concept ?
8. What are the advantages of declaring virtual functions in a program ?
9. Explain the exception handling with an example.
10. What is a sequence ? What are its functions ?

(10 × 4 = 40 marks)

Part B

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

Module 1

11. (a) Write a C++ program to read two numbers from the keyboard and display the larger value on the screen. (8 marks)

    (b) Why do we need the preprocessor directive # include< iostream. h > ?

(4 marks)

Or

12. Write a program to evaluate

$$\cos x = 1 - \frac{x^2}{\lfloor 2} + \frac{x^4}{\lfloor 14} - \frac{x^6}{\lfloor 6} + \cdots$$ to an accuracy of 0.0001%.

Turn over

Module 2

13. (a) Compare C++ class and C++ structure.

(b) Write a function to read a matrix of size $m \times n$ from the keyboard.

Or

14. Define a class to represent a bank account by including the following members :

Data members :

(i) Name of the depositor.

(ii) Date of birth.

(iii) Account number.

(iv) Type of account.

(v) Balance amount in the account.

Member of functions :

(i) to assign initial values.

(ii) to deposit an amount.

(iii) to withdraw an amount after checking the balance.

(iv) to display name and account number and balance.

Module 3

15. Write an example in C++ to illustrate the use of an array of objects.

Or

16. Assume that different schemes offer compound interest at the rate of 4%, 8%, 10%, and 12%. Prepare a program showing the amount returned if an investor invests Rs. 10,000 for a period of 1, 2, 3, 4 and 5 years.

Module 4

17. Distinguish between Method overloading and Operator overloading. Give program examples for each.

Or

18. What is inheritance ? Tabulate the effect of an accessibility of members when a base class is derived using different access modifiers.

Module 5

19. What is a virtual base class ? Give program examples and its applications.

Or

20. Explain the role played by Dynamic Linked Libraries in creating efficient programs. What are the four main windows DLL libraries? Describe the constituents of each.

(5 × 12 = 60 marks)

20. Given two random processes X (t) and Y(t) as

$$X(t) = Z_1(t) + 3Z_2(t-\tau)$$

$Y(t) = Z_2(t+\tau) + 3Z_1(t-\tau)$, here $Z_1(t)$ and $Z_2(t)$ are independent while noise processes each with a variance equal to 0.5. Determine :

(a) Autocorrelation functions of X(t) and Y(t).

(b) Cross correlation function of X (t) and Y (t).

(5 × 12 = 60 marks)

F 9357 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fourth Semester

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

SIGNALS AND SYSTEMS (L A S T)

(2002 admission onwards–Supplementary)

Time : Three Hours Maximum : 100 Marks

Missing datas can be suitably assumed.

Part A

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

1. How will you define invertibility property of a continuous time system ? Give an example.
2. Determine whether the following continuous time systems are causal or non causal :

   (i) $y(t) = x(2t)$

   (ii) $y(t) = \int_{-\infty}^{t} x(t)dt$.
3. State and prove time differentiation property of Fourier Transform.
4. Find the Fourier Transform of the signal $x(t) = t\,e^{-\alpha t}\,u(t)$. What is the restriction on α for the Fourier Transform to exist ?
5. Find the DTFT of the causal exponential sequence defined by $x(n) = a^n\,u(n)$.
6. Determine the time domain signal corresponding to the Fourier Transform $x(jw) = e^{-2w}u(w)$.
7. State and prove the time reversal property for z-transform.
8. Find the Laplace Transform of $t \cos(w_o t)\,u(t)$.
9. State the autocorrelation theorems for energy signals and for power signals.
10. Define cross-correlation of two Discrete Time energy signals. How and why is this expression for cross-correlation modified in the case of Discrete Time power signals ?

(10 × 4 = 40 marks)

Turn over

Part B

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

Module 1

11. Test the periodicity of the following functions and find their fundamental intervals :

(i) e^{at}.

(ii) e^{jat}.

(iii) $\cos 5\pi t$.

(iv) $\sin 8t$.

(v) $\cos(3\pi t) - \sin(6\pi t)$.

(vi) $\sin^2(4t)$.

(6 × 2 = 12 marks)

Or

12. (i) A continuous time LTI system is described by $\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 4y(t) = 6x(t)$. Find the output for the system when the input signal is $x(t) = e^{-2t}u(t)$.

(8 marks)

(ii) Show that a discrete time LTI system is BIBO stable if its impulse response $h(n)$ is absolutely summable ?

Module 2

13. (i) $x(t)$ is a periodic function with a period $T_o = \frac{1}{f_o}$ and is continuous. Show that $\dot{x}(t)$ is also periodic function with the same period. How are the complex exponential Fourier series coefficients of $\dot{x}(t)$ related to those of $x(t)$?

(6 marks)

(ii) Find the frequency response of a continuous time LTI system represented by the impulse response $h(t) = e^{-|t|}$.

(6 marks)

Or

14. (i) Determine the complex exponential Fourier series expansion of the periodic signal

$$x(\theta) = \begin{cases} A\sin\theta, & 0 \le \theta \le \pi \\ 0, & \pi \le \theta \le 2\pi \end{cases}$$

(8 marks)

(ii) Determine the time domain signal $x(t)$ corresponding to the Fourier Transform

$$X(j\omega) = \frac{1}{(j\omega)^2 + j7\omega + 12}.$$

(4 marks)

Module 3

15. A discrete time signal is defined by $x(nT) = \begin{cases} 1 & |n| \le 3 \\ 0, & |n| > 3 \end{cases}$. The sampling interval T = 0.1 sec. Determine and sketch the amplitude and phase spectra of this signal.

Or

16. (i) Find the inverse DTFT of $X(\Omega) = \frac{3 - \frac{5}{4}e^{-j\Omega}}{\frac{1}{3}e^{-j2\Omega} - \frac{3}{4}e^{-j\Omega} + 1}$.

(6 marks)

(ii) Determine the DTFS representation for the sequence $x(n) = \cos^2\left(\frac{\pi}{8}\right)n$.

(6 marks)

Module 4

17. (a) Find the inverse z-transform using partial fraction method

$$x(z) = \frac{-1 + 5z^{-1}}{\left(1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}\right)} \text{ with ROC } |z| > |.$$

(8 marks)

(b) Find the z-transform of a ramp sequence.

(4 marks)

Or

18. (a) Explain how frequency response is obtained from poles and zeros.

(6 marks)

(b) Explain z-transform and ROC of the following sequence $x[n] = -b^n\, u[-n-1]$.

(6 marks)

Module 5

19. (a) Find the autocorrelation function and energy spectral density of the signal

$$x(t) = e^{-t}\, u(t).$$

(8 marks)

(b) The probability density function (PDF) of a continuous random variable is of the form

$f_x(x) = \frac{1}{2}e^{-|x|}$ for $-\infty < x < \infty$. Determine the mean of the random variable.

(4 marks)

Or

Turn over

F 9323 (Pages : 3) Reg. No.....IT.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fourth Semester

ENGINEERING MATHEMATICS—III (CMELRPTANSUF)

(2002 admissions onwards—Supplementary)

[Common to all branches]

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 $x^2 y dx = (x^3 - y^3)\, dy$; $y(1) = 1$. (5 marks)

(b) Solve $y' = \dfrac{2x + 2y - 1}{3x + y - 2}$. (5 marks)

(c) A tank contains 100 litres of fresh water. 2 litres of brine, each containing 1 gm of dissolved salt, run into the tank per minute, and the mixture kept uniform by stirring uniformly. Water runs out at the rate of 1 litre per minute. Find the amount of salt present when the tank contains 150 litres of brine. (10 marks)

Or

(d) Solve $y = x + 2\tan^{-1} p$. (5 marks)

(e) Solve $e^{4x}(p-1) + e^{2y} p^2 = 0$. (5 marks)

(f) Calculate the amount of heat passing through 1 cm^2 of a refrigerator wall, if the thickness of the wall is 6 cm and the temperature inside the refrigerator is 0°C while outside it is 20°C. Assume k = 0.0002. (10 marks)

Module 2

2. (a) Solve $q(p - \cos x) = \cos y$. (5 marks)

(b) Solve by Charpit's method : $pxy + pq + qy = yz$. (8 marks)

(c) Solve $\dfrac{\partial^2 z}{\partial x^2} - 2\dfrac{\partial^2 z}{\partial x \partial y} + \dfrac{\partial^2 z}{\partial y^2} = \sin x$. (7 marks)

Or

Turn over

(d) Find the complete solution of :

$$\frac{\partial^3 z}{\partial x^3} - 4\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial x \partial y^2} = 4\sin(2x + y).$$

(10 marks)

(e) A tightly stretched string with fixed ends points $x = 0$ and $x = l$ is initially in a position given by $y = y_0 \sin^3\left(\frac{\pi x}{l}\right)$. If it is released from rest from its position, find the displacement $y(x, t)$.

(10 marks)

Module 3

2. (a) Find the Fourier Integral representation of the function :

$$f(x) = \begin{cases} c, & x < 0 \\ 1/2, & x = 0 \\ e^{-x}, & x > 0 \end{cases}$$

(8 marks)

(b) Find the Fourier sine and cosine transforms of $2e^{-5x} + 5e^{-2x}$. (12 marks)

Or

(c) Using Parseval's identity show that $\int_0^\infty \frac{x^2 dx}{(1+x^2)^2} = \pi/4$. (10 marks)

(d) Solve the integral equation $\int_0^\infty f(\theta)\cos\alpha\theta\, d\theta = \begin{cases} 1-\alpha, 0 \le \alpha \le 1 \\ 0, \quad \alpha > 1 \end{cases}$ Hence evaluate $\int_0^\infty \frac{\sin^2 t}{t^2} dt = \frac{\pi}{2}$.

(10 marks)

Module 4

4. (a) The probability that a man aged 70 will live to be 75 is 0.65. What is the probability that out of ten men now 70, at least 7 would live to be 75 ?

(8 marks)

(b) An aptitude test for selecting design Engineers in an IT firm is conducted on 1000 candidates. The average score is 42 and the standard deviation of score is 24. Assuming normal distribution for the scores, find :

(i) The number of candidates whose scores exceed 60.

(ii) The number of candidates whose scores lie between 30 and 60.

(12 marks)

(c) In a certain factory turning razor blades, there is a small chance of 0.002 for any blade to be defective. The blades are supplied in packets of 10. Use Poisson distribution to calculate the approximate number of packets containing no defective, one defective and three defective blades respectively in a consignment of 10,000 packets.

(12 marks)

(d) Find the equation of the best fitting normal curve to the following distribution :

x :	0	1	2	3	4	5
y :	13	23	34	15	11	4

(8 marks)

Module 5

5. (a) In a group of 50 first cousines there were found to be 27 males and 23 females. Ascertain if the observed proportions are inconsistent with the hypothesis that the sexes should be in equal proportion ?

(10 marks)

(b) Fit a binomial distribution to the data :

x :	0	1	2	3	4	5
f :	36	144	340	282	163	25

and test for goodness of fit, at the level of significance 0.05.

(10 marks)

Or

(c) The correlation between height and weight in a sample of 200 ten year old boys is 0.7 and the correlation between height and weight in a sample of 250 ten year old girls is 0.62. Is the difference significant ?

(10 marks)

(d) A research worker wishes to estimate mean of a population by using sufficiently large sample. The probability is 95% that sample will not differ from the true mean by more than 25% of the S.D. How large a sample should be taken ?

(10 marks)

[5 × 20 = 100 marks]