EXAMINATION TIME TABLE
PROGRAMME - S.E. (Information Technology) (Choice Based)
SEMESTER - III

Days and Dates	Time	Paper Code	Paper
Thursday, November 14, 2019	02:30 p.m. to 05:30 p.m.	51401	APPLIED MATHEMATICS –III
Monday, November 18, 2019	02:30 p.m. to 05:30 p.m.	51402	LOGIC DESIGN
Wednesday, November 20, 2019	02:30 p.m. to 05:30 p.m.	51403	DATA STRUCTURES & ANALYSIS
Friday, November 22, 2019	02:30 p.m. to 05:30 p.m.	51404	DATA BASE MANAGEMENT SYSTEM
Tuesday, November 26, 2019	02:30 p.m. to 05:30 p.m.	51405	PRINCIPLE OF COMMUNICATIONS

[Time: 3 Hours]   **[Marks:80]**

Please check whether you have got the right question paper.

N.B: 1. Q 1 is compulsory.
       2. Attempt any three from remaining
       3. Rights indicate full marks.

1.   a. If A, B, C are subset of universal set V then prove that $A \times (B \cap C) = (A \times B) \cap (A \times C)$ **05**

     b. If f: R→R is given by y = 2x + 1, prove that f is one to one and onto and find f^{-1} **05**

     c. Find L $\{(1 + t\bar{e}^t)^3\}$ **05**

     d. Check whether the following function Harmonic or not $3x^2 + \sin x + y^2 + 5y + 4$ **05**

2.   a. Find k if f (z) = $\frac{1}{2}$ log $(x^2 + y^2) + i \tan^{-1}\frac{kx}{y}$ is analytic   **06**

     b. Find L $\{|\sin 2t|\}$ **06**

     c. Let f: R→R   f(x)   =   x²+2x-1   **08**
        g: R→R   g(x)   =   4x²+2

     Find (I) f 0 (gof)   (II) go (fog)

3.   a. Find Bilinear transformation under which Z=1, -i, -1 from point w =i, 0, -i   **06**

     b. If A be the set of non-integers and let R be a relation on A×A defined by (a, b) R(c, d) if   **06**
     ad=bc, then prove that R is an equivalence relation.

     c. Find (1) L $\left\{\int_0^t \bar{e}^u \frac{\sin u}{u} du\right\}$ **08**

        (2) L $\{(1 + 2t + 3t^2 + t^3)H(t - 2)\}$

4.   a. Use convolution them and evaluate   **06**
        $L^{-1}\left\{\frac{(s+5)^2}{(s^2+10s+16)^2}\right\}$

     b. Find transitive clouser of following relation defined on A= $\{a, b, c, d, e\}$ by Warshal   **06**
     algorithm R=$\{(a, a) (a, b) (b, c) (c, d) (c, c)(d, e)\}$

     c. A man speaks truth 3 times out of 5 when a die is thrown he states that it gave an ace what   **08**
     is probability that this event has actually happened.

5. a. How many four digit numbers can be formed out of the digits 1, 2, 3, 5, 7, 8, 9 if no digit is repeated twice? How many of them will be greater than 3000. **06**

b. Solve using Laplace transform **06**

$\frac{d^2y}{dt^2} + 9y = 18$ given that y (0) = 0 and y $(\frac{\pi}{2})$=0

c. Evaluate (1) $L^{-1}\left\{\frac{1}{\sqrt{2s+1}}\right\}$ **08**

(2) $L^{-1}\left\{\frac{2s^2-6s+5}{s^3-6s^2+115-6}\right\}$

6. a. Solve $a_n = 5a_{n-1} - 6a_{n-2}$ for $n \geq 2, a_0 = 0, a_1 = 1$ **06**

b. Find orthogonal curves of family of curves e^{-x} Cos y +xy= α, where α is the real constant **06**

c. i. Find the image of rectangular region bounded by x=0, x=3, y=0, y=2 under the transformation w= z+(1+i) **08**

ii. A fair dice is thrown thrice. Find probability that sum of numbers obtained is 10.

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(3 Hours)   (Total Marks : 80)

Please check whether you have the right question paper.

N.B.:   1)   Questions **No. 1** is **compulsory**.
        2)   Solve **any three** question out of remaining **five** questions.
        3)   Assume suitable **data** if **necessary**.
        4)   **Figures** to the **right** indicate **full marks**.

1   Solve any **four** out of five :   (20)
    a)   Why biasing is necessary in BJT amplifier?
    b)   Solve $(35)_{10} - (47)_{10}$ using two's compliment method.
    c)   Define :
         i)   truth table
         ii)   standard SOP
         iii)   De-Morgan's theorem
         iv)   Duality theorem
         v)   universal gate
    d)   Define multiplexer and state its application.
    e)   Convert S-R flip-flop to T flip-flop.

2.   a)   Using Quine-Me-dusky method determine minimum SOP form for   (10)
          $$f(A, B, C, D) = \sum m(0, 1, 3, 7, 8, 9, 11, 15)$$

     b)   What do you mean by differential amplifier? What is its primary function? State   (10)
          different configurations of it, which one is popularly used.

3.   a)   Draw & explain Ring counter using suitable waveforms.   (10)
     b)   Implement the following using only one 4:1 MUX and few gates :   (10)
          $$f(A, B, C, D) = \sum m(0, 1, 3, 4, 5, 7, 9, 10, 12, 15)$$

4.   a)   Design MOD-9 Synchronous counter using J-K flip-flop.   (10)
     b)   Design four bit BCD adder using IC7483.   (10)

5.   a)   What is shift register? Mention different modes of operation of shift register?   (10)
     b)   State and explain various VHDL data objects in brief.   (10)

6.   Solve the following **(Any Four)** :   (20)
     a)   VHDL program format.
     b)   Difference between combinational circuit and sequential circuits.
     c)   Different biasing methods.
     d)   Race-around condition in flip-flop.
     e)   Current mirror circuit.
     f)   Arithmetic logic unit.

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(3 Hours)   **[Total Marks: 80]**

N.B.: (1) Question No.1 is compulsory.

     (2) Attempt **any three** out of remaining questions.

     (3) Assume Suitable data if necessary.

   (4) **Figures** to the **right** indicate full **marks**.

1.	(a)	Explain different types of queues in data structures.	**3**
	(b)	How does binary search different from linear search?	**3**
	(c)	Explain Doubly Linked List.	**3**
	(d)	Define graph and list any three applications of graph.	**3**
	(e)	Write postfix form of the following infix expression. A+(B*(C-D)/E)	**3**
	(f)	Explain linear and nonlinear data structures.	**2**
	(g)	Write a note on recursion.	**3**

2.	(a)	Explain Binary search tree. Construct Binary search tree for following elements: **45, 39, 56, 12, 34, 78, 32, 10, 89, 54, 67, 81**	**10**
	(b)	What is Singly Linked List? Write an algorithm to implement following operations on Singly linked List. (1)Insertion(All cases) (2)Deletion(All cases) (3)Traversal	**10**

3.	(a)	Write an algorithm for implementing stack using array.	**10**
	(b)	Write an algorithm for merge sort and comment on its complexity.	**10**

4.	(a)	Construct the binary tree for Inorder and Preorder traversal sequence given below Inorder: DBEAFCG Preorder: ABDECFG Write a function to traverse a tree in Postorder sequence.	**10**
	(b)	Write an algorithm for quick sort and comment on its complexity.	**10**

5. (a) What is collision? What are the methods to resolve collision? Explain Linear probing with an example. **10**

(b) What is Minimum Spanning Tree? Draw the MST using kruskal's and prim's algorithm and find out the cost with all intermediate steps. **10**
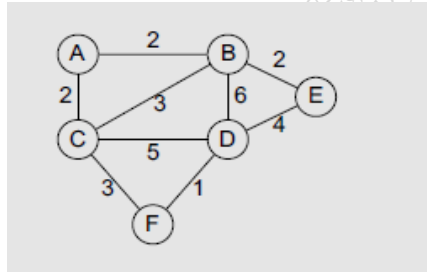
6. Write short notes on (**Any 4**) 20
   a) Asymptotic notations
   b) Double Ended Queue(De-Queue)
   c) Insertion Sort
   d) DFS and BFS
   e) Expression Tree.

(3 Hours)   **[Total Marks: 80]**

N.B.:- (1) Question No. **1** is **Compulsory**.

(2) Solve any **three** questions from the remaining **five** questions.

(3) **Figures** to the **right** indicate **full** marks.

(4) Make **suitable** assumptions wherever **necessary** and state them **clearly**.

1. (a) Define generalization and specialization.   **5**
   (b) Explain different keys in DBMS.   **5**
   (c) Explain role of DBA.   **5**
   (d) Compare traditional file system with DBMS.   **5**

2. (a) List the functional dependencies which satisfy the relation: **10**

X	y	z
X1	Y1	Z1
X1	Y2	Z1
X2	Y2	Z1
X2	Y2	Z1

   (b) Suppose you are given the following requirements for a simple database of the National Cricket Trophy (NCT):   **10**
   - the NCT has many teams,
   - each team has a name, a city, a coach, a captain, and a set of players,
   - each player belongs to only one team,
   - each player has a name, a position (such as left wing or goalie), a skill level,
   - and a set of injury records,
   - a team captain is also a player,
   - a game is played between two teams (referred to as host team and guest team) and has a date (such as May 11th, 1999) and a score (such as 4to 2).

   Construct ER diagram for the NCT database.

3. (a) Explain different types of operations in relational algebra.   **10**
   (b) Explain Joins and types of Joins with suitable example.   **10**

4. (a) Define Normalization. Explain 1NF,2NF and 3NF with suitable example.   **10**
   (b)   **10**
   Consider the following schema for College Library.

   Student (Roll_no, Name, Branch)

   Book (ISBN, Title, Author, Publisher)

   Issue (Roll_no, ISBN, Date_of_ Issue)

Write SQL queries for the following statements:

i. List Roll Number and Name of all students of the branch IT.
ii. Find the name of students who have issued a book published by 'XYZ' publisher.
iii. List title of all books and their author issued by student 'Alice'
iv. List title of all books issued on or before 31ˢᵗ DEC, 2019

5. (a) Explain Event Condition Action (ECA) model with suitable example. **10**
   (b) Explain types of Integrity Constraints with example. **10**

6. Write note on (**any four**): **20**
   (a) DDL commands.
   (b) Hashing Techniques.
   (c) Data Independence.
   (d) Types of attributes.
   (e) Aggregate function in SQL.

(3 Hours)   **[Total Marks: 80]**

N.B. (1) Question No.1 is compulsory.
    (2) Out of remaining attempt any three.
    (3) Assume & mention suitable data wherever required.
    (4) Figures to right indicates full marks.

Q.1. Solve any four   **[20]**
    a). Explain need of modulation. Justify it with example.
    b). Define the following terms.
        i) . Noise figure   ii). Noise temperature   iii). Noise bandwidth
        iv) Noise voltage   v) Modulation.
    c). Compare AM and FM.
    d). Explain in short pre-emphasis and De-emphasis.
    e). What is PSK signal. Draw the PSK signal for the following binary signal 111010011.
    f). Explain the principle of reflection and refraction.

Q.2 a). Define signal to noise ratio. Explain the effect of cascade connection on a signal
        to noise ratio. Derive Friss formula for two stage cascade amplifier.   **[10]**
    b). State and prove the following properties of Fourier transform with example
        i) Convolution in time domain ii) Time scaling   **[10]**

Q.3. a) The AM Transmitter develops an unmodulated power o/p of 400 Watts across a
        50Ω resistive load. The carrier is modulated by a sinusoidal signal with a modulation
        index of 0.8. Assuming f_m= 5KHz and f_c= 1MHz.   **[10]**
        (i) Obtain the value of carrier amplitude Vc and hence write the expression for
            AM signal.
        (ii) Find the total sideband power.
        (iii) Draw the AM wave for the given modulation index.
    b). With the help of neat circuit diagram explain Indirect method of FM generation. **[10]**

Q.4 a). What are the limitations of TRF receiver? Explain how these limitations are avoided
        using super-heterodyne receiver.   **[10]**
    b). Compare ground wave, sky wave, space wave and tropospheric scatter propagation.**[10]**

Q.5 a). State Sampling theorem, write down the steps to prove sampling theorem, draw
        waveform for low pass band limited signal.   **[10]**
    b). Draw the block diagram of PWM generator and detector. Explain the working giving
        waveforms at the output of each block.   **[10]**

Q6. a). Explain slope overload error and hunting error in Delta modulation. Derive the
        condition to avoid slope overload distortion.   **[10]**
    b) . Explain the generation and detection of FSK signal.   **[10]**

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