(3 Hours)   [Total Marks : 100

N.B. (1) Question No. **1** is **compulsory**.
   (2) Attempt any **four** questions out of the reamaining **six** questions.
   (3) **Figures** to the **right** indicate **full** marks.

1. (a) Explain the major services provided by the Internet. Also define WWW and URL.   10
   (b) Explain the various steps involved in Software Development Life Cycle.   10

2. (a) Discuss the various generations and characteristics of Computer Systems.   10
   (b) Define network topology. Explain the different network topologies used in Computer   10
       Networks.

3. (a) Define Computer Virus. Explain the different types of Computer Viruses.   10
   (b) Explain the general model of Data Communication. Discuss the role of MODEM.   10

4. (a) Discuss WAP with references to its application, motivation, advantages and   10
       specification.
   (b) Define Data and Information. What are the differences ? Explain the value   10
       and quality of information.

5. (a) Explain TCP/IP Communication Protocol in details.   10
   (b) Define Software. What are the roles and categories of System Software and   10
       Application Software ? Explain with examples.

6. (a) What is the necessity of Computer Network ? Explain ISO-OSI reference model.   10
   (b) Define file. Explain file organization and file types.   10

7. Write short notes on any **four** of the following :—   20
       (a) JAVA and HTML
       (b) Firewalls
       (c) E-Commerce
       (d) ISDN
       (e) Data Ware-Housing.

Con. 5529–10.
Applied Mathematics III
GT–6318

(3 Hours)
[Total Marks : 100]

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** from remaining **six** questions.
(3) **Figures** to **right** indicates the **full** marks.
(4) Assume the **suitable** data if **required** with **justification**.

1. a) Find the Inverse Laplace Transform of $\dfrac{1}{s\sqrt{s+4}}$ [20]

   b) Find the orthogonal trajectory of the family of curves given by $x^3 y - xy^3 = c$

   c) Evaluate $\displaystyle\int_C \frac{1}{z}\,dz$ where C is the upper half of $|z| = 1$.

   d) Show that every Skew-Hermitian matrix can be expressed in the form $P + iQ$, where P is real Skew-Symmetric and Q is real Symmetric matrix.

2. a) Determine the analytic functioin whose real part is $\dfrac{\sin 2x}{\cosh 2y + \cos 2x}$ [6]

   b) Evaluate the Integral $\displaystyle\int_0^{\infty} \frac{e^{-\sqrt{2}\,t}\,\sin t\,\sinh t}{t}\,dt$ [6]

   c) Reduce to normal form and find rank of the following matrix : [8]

   $$\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$$

3. a) Solve the following Differential Equations using Laplace Transformation [6]

   $$\frac{d^2 y}{dt^2} + 4y = f(t) \qquad ; \qquad f(t) = H(t-2), \; y(0) = 0 \,, \; y'(0) = 1$$

   b) Find the sum of the residues at singular points of [6]

   $$f(z) = \frac{z}{(z-1)^2 (z^2 - 1)}$$

3.a) Solve the following Differential Equations using Laplace Transformation [6]

$$\frac{d^2y}{dt^2} + 4y = f(t) \qquad ; \qquad f(t) = H(t-2), \quad y(0) = 0, \quad y'(0) = 1$$

b) Find the sum of the residues at singular points of [6]

$$f(z) = \frac{z}{(z-1)^2(z^2-1)}$$

c) Find the Fourier Series for $f(x) = \begin{cases} 0 & -\pi \leq x \leq 0 \\ Sinx & 0 \leq x \leq \pi \end{cases}$ & [8]

deduce that

$$\frac{1}{1\cdot3} - \frac{1}{3\cdot5} + \frac{1}{5\cdot7} - \ldots = \frac{\pi-2}{4}$$

4. a) State True or False with justification : [6]

1) Every diagonal element of Hermitian matrix is real.

2) If A is a skew-symmetric matrix of order 3 then $rank(A)$ is less than 3.

b) If $A = \dfrac{1}{3}\begin{bmatrix} 1 & 2 & a \\ 2 & 1 & b \\ 2 & -2 & c \end{bmatrix}$ is orthogonal then find the values of a, b, c. [6]

c) State and prove Cauchy's integral theorem and hence evaluate $\int_C \cot z\, dz$ where C is [8]

$\left| z + \dfrac{1}{2} \right| = \dfrac{1}{3}$.

5.a) Find the Fourier Series of the function $f(x) = e^{-x}$, $0 < x < 2\pi$ and $f(x + 2\pi) = f(x)$ [6]

b) Show that the set of functions $\left\{ \dfrac{\cos x}{\sqrt{\pi}}, \dfrac{\cos 2x}{\sqrt{\pi}}, \dfrac{\cos 3x}{\sqrt{\pi}}, \ldots\ldots \right\}$ form an orthonormal set over [6]

an interval $[-\pi, \pi]$.

c) Find the Inverse Laplace Tranform of i) $\dfrac{e^{-5s}}{(s-2)^4}$ [8]

ii) $\dfrac{s}{\left(s^4 + 8s^2 + 16\right)}$ (using Convolution Theorem) [8]

6. a) Obtain Fourier series representation for $f(x) = x^2 - 2$, $-2 \le x \le 2$ [6]

b) Evaluate $\displaystyle\int_{-\infty}^{\infty} \dfrac{x^2 + x + 2}{x^4 + 10x^2 + 9}\, dx$ [6]

c) Obtain Laurent and Taylor's series for $\dfrac{z-1}{z^2 - 2z - 3}$ indicating region of convergence [8]

7.a) Find Half range cosine series for $f(x) = \sin x$ in $(0, \pi)$. [6]

b) If $L\{f(t)\} = \overline{f}(s)$ then show that $L\left\{\dfrac{f(t)}{t}\right\} = \displaystyle\int_s^{\infty} \overline{f}(s)\, ds$ Hence find L.T of $\dfrac{Sin\ t}{t\, e^t}$ [6]

c) Show that the equations $-2x + y + z = a$, $x - 2y + z = b$, $x + y - 2z = c$ have no solutions unless [8]

$a + b + c = 0$ in which case they have infinitely many solutions. Find these solutions when

$a = 1, b = 1, c = -2$.

P4–Con No-70

Con. 6533–10.

GT–8265

(3 Hours)   [Total Marks : 100

NOTE: 1)Q1 is compulsory
       2).Solve any **Four** Question Out Of Six Questions.

1[A] If Aj= {n∈ N: n is divisible by i} .Find A2∪A5   and   A2∩A5.   [5]

 [B] Find the solution to the recurrence relation $a_n=6a_{n-1}+11a_{n-2}-6a_{n-3}$ with initial condition
     $a_0=2$, $a_1=5$ and a2=15.   [5]

 [C] Determine whether the following are equivalent using biconditional statement
     I] $(P→ q) →t ≅ (p∧\sim q) →t$ [5]

 [D] Show that the (2,5) encoding function $e:B^2→B^5$ defined by

     e(00)=00000,e(10)=10101,e(01)=01110,e(11)=11011 is group code   [5]

2.A] Show that the sum of the cubes of three consecutive integers is divisible by 9.   [5]

 B] G be a set of all square matrices of type $\begin{bmatrix} 1 & m \\ 0 & 1 \end{bmatrix}$ where m∈ Z.Prove that G is group under

    Multiplication. Is it a abelian group?   [5]

 C] Let H=$\begin{bmatrix} 1 & 1 \\ 1 & 0 \\ 1 & 0 \\ 0 & 1 \end{bmatrix}$ be a parity check matrix .Decode the following words relative to

    Maximum likelihood decoding function (**I**) 0101 (**II**) 1010   (**III**) 1101   [10]

3.A] Let A= {1, 2, 3, 4, 8} B= {1, 4, 6, 9}.Let a R b if and only if (a divides b).write the
     relation in Matrix form.   [5]

 B]Let A={1,2,3,4} and R={(1,1),(2,2),(3,3),(4,4),(2,1),(1,2),(2,3),(3,2),(3,1)(1,3)}
    Prove that R is an equivalence relation. Also find its matrix and draw its diagraph. [5]

 C] Consider the set A= {1, 2, 3, 4, 5, 6} under the multiplication mod 7.   [10]
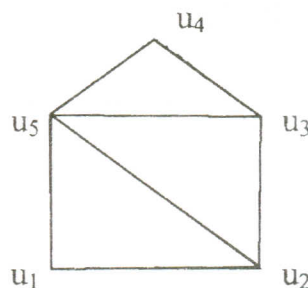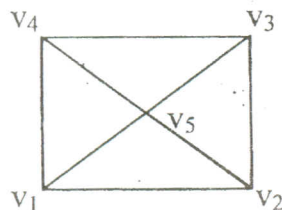   1. Find the multiplication table for above
    2. Find the inverses of 2,3,5,6
    3. Prove that it is a cyclic group
    4. Is G is cyclic.

4.A] Let A= {1, 2, 3, 4} and let R= {(1, 2), (2, 3), (3, 4), (2, 1)} Find Transitive closure of
     R using warshall's algorithms   [5]

 B] Show that the adjoining graphs are isomorphic.   [5]

[TURN OVER

C] It was found that in a class 80 student passed in English, 60 passed in Science and   [10]
50 passed in Mathematics. It was also known that 30 student passed both English
and Science ,15 passed in English and Mathematics and 20 passed in Science and
Mathematics.10 student passed in all the three subjects. If there were 150 student
in the class find,
I)   How many students passed in at least one subject
II) How many passed in English only
III) How many passed in at least two subjects.
IV) How many failed in all the subjects.

5.A] Let A= {1, 2, 3, 5, 6, 10, 15, 30} and R be the relation "is divisible by". Obtain the
relation matrix and draw the Hasse diagram.   [5]
B] Given the poset (D4, ≤) and (D9, ≤) under the usual notation, draw the Hasse Diagram of
L=D4xD9 under the product partial order.   [5]
C] Prove that R= {0, 2, 4, 6, 8} is a commutative ring under $_{10}$addition and $_{10}$multiplication

Under modulo 10   [10]

6.A] Define Integral Domain and Fields with example.   [5]
B] let $f(x) =2x+3$, $g(x) =3x+4$, $h(x) =4x$ for $x \in R$, Where R=set of real   [5]
numbers find gof,   fog,   foh,   hof,   goh
C] Let R and S be the given relation from A to B Compute   [10]
R^c, R0S, R∩S, R∪S, S0R · A=B={1,2,3}
R={(1,1),(1,2),(2,3),(3,1)}   S={(2,1),(3,1),(3,2),(3,3)}

7.A] Let A= {0, 1, 2, 3, 4, 5}.Find the table for addition and multiplication modulo 6.   [5]
Verify whether it is an integral domain.

B] Define Distributive Lattice. and sub lattice with example   [5]

C] A] Let H given by $H=\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ be a parity check matrix.   [10]

Determine the group code $e_H:B^3 \to B^6$

P4–Con No–142

Con. 6190–10. GT–6312

(3 Hours) **[Total Marks : 100**

N. B.: (1) Question no. **1** is compulsory.
   (2) Answer any **four** out of the remaining questions.

1. (a) Write advantages of DBMS over a file system. 05
   (b) Explain Murphy's law of GUI Design with the help of an example. 05
   (c) What is a view ? How is it created and stored ? 04
   (d) Explain the following controls of Visual Basic : 06
      (i) Listbox
      (ii)Combobox
      (iii)Checkbox

2. (a) Explain following Relational algebra operators with suitable examples : 10
      (i) Select
      (ii) Project
      (iii) Join
      (iv) Division
      (v) Cartesion product
   (b) What is transaction ? Discuss state transition diagram and properties
      of transaction. 10

3. (a) Elaborate design consideration of GUI. 10
   (b) Discuss Option Explicit Statement with example. 10

4. (a) What do you understand by deadlocks in database system ? Explain how it is
      prevented 10
   (b) Explain any one Timestamp based protocol. 10

5. (a) For the given employee database give an expression in SQL for the following :
         Employee(empname, street,city) 10
         Works(empname,company-name,salary)
         Company (company-name , city)
         Manages (empname , manager-name)
   (i) Modify the database so that 'Ram' now lives in 'Mumbai'
   (ii) Give all employees of Satyam a 50 percent raise.
   (iii) List all the employees who live in the same cities as their managers

   (b) Define Serializability ? Explain conflict and view serializability. 10

6. (a) Explain rules for converting ER model to relational model. 10
   (b) Construct ER diagram for a bank (state the assumptions clearly). Convert this ER diagram
   into   tables. 10

7. Write short notes on :-
   (i) Weak entity set, Specialization ,Generalization 07
   (ii) Total participation, Partial participation, Unique key , primary key and partial key 06
   (iii) Logbased and checkpoint based recovery mechanisms. 07

80 Dec 2010

Con. 5529-10.

S. E. / IT / Sem III

Applied Maths III

GT-6318

(3 Hours)

[Total Marks : 100]

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

(2) Attempt any **four** from remaining **six** questions.

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

(4) Assume the **suitable** data if **required** with **justification**.

1. a) Find the Inverse Laplace Transform of $\dfrac{1}{s\sqrt{s+4}}$ [20]

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$a + b + c = 0$ in which case they have infinitely many solutions. Find these solutions when

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(3 Hours)　　　　　　　　　[Total Marks : 100

Electronic Devices & linear circuits

N.B. : (1)　Question No. **1** is **compulsory**.
　　　　(2)　Solve any **four** questions from remaining **six** questions.

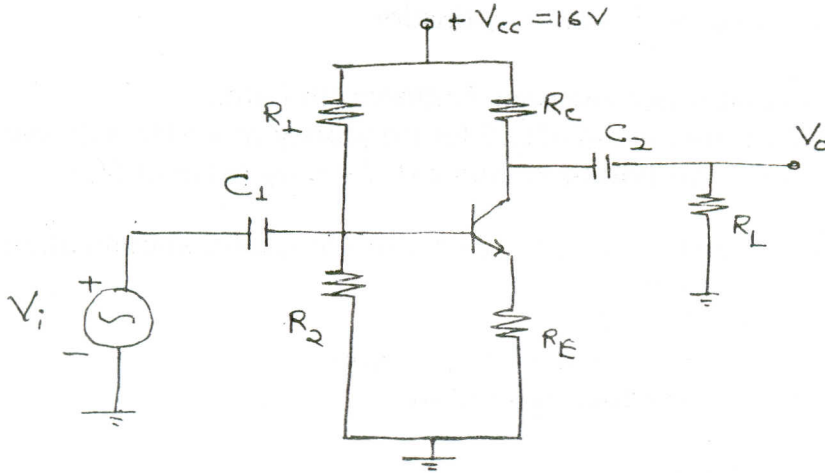1.　(a)　Derive the equation for Z_i, Z_o, A_v and A_I for the ckt shown in **Fig. 1**.　　10

Fig 1

　(b)　Write a note on current mirror ckt.　　5
　(c)　For op-amp explain following terms and give practical values　　5
　　　(i)　Supply voltage rejection ratio
　　　(ii)　Slew rate
　　　(iii)　CMRR.

2.　(a)　For the difference amplifier shown in **Fig. 2**.　Determine the following :—
　　　(i)　DC bias Q point (V_{CEQ} and I_{CQ})　　6
　　　(ii)　Voltage gain A_d　　3
　　　(iii)　Voltage gain A_c　　3
　　　(iv)　CMRR in dB.　　3

Transistor data

$hie = 1 K\Omega$　$hfe = \beta = 100$

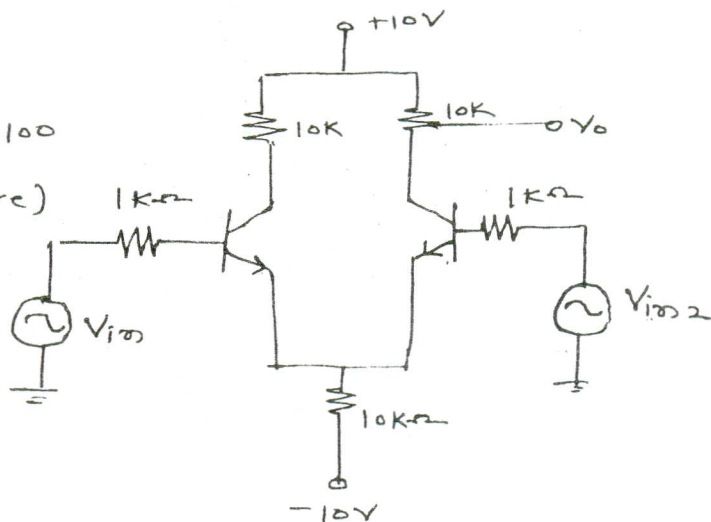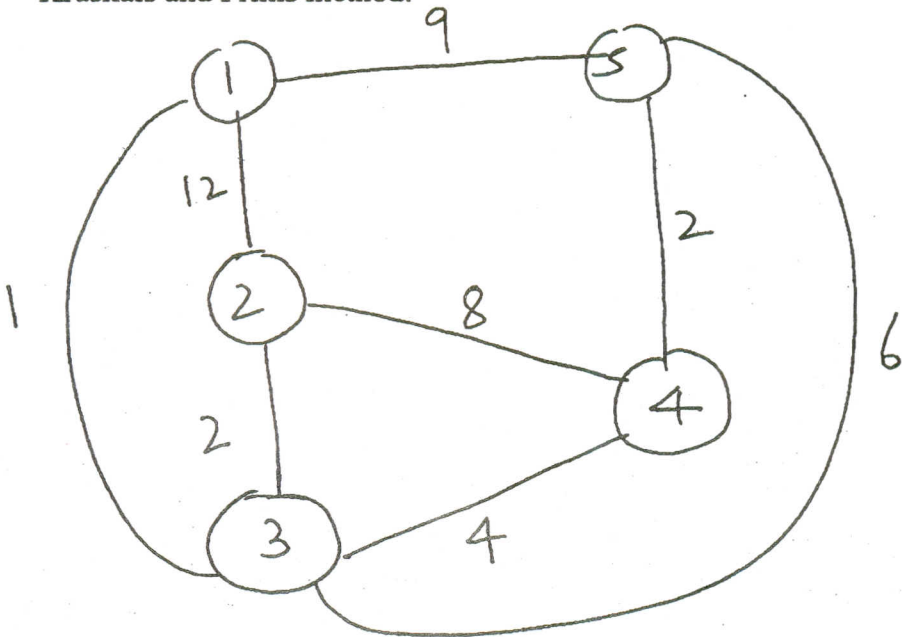(neglect hoe and hre)

$V_{BE} = 0.6$

Fig 2

　(b)　Draw block diagram of op-amp and give function of each block.　　5

[TURN OVER

3. (a) Draw the ckt of instrumentation amplifier and derive the gain expression for it.   **10**
    (b) Design Wein bridge oscillator for a frequency of 1 KHz.   **10**

4. (a) Draw the ckt. of astable multivibrator using op-amp. Derive the expression for frequency **10**
         of oscillations and design ckt. for the specifications V_{cc} = ±15 V
         V_0 = ±10 V   Frequency f = 1 KHz.
    (b) Explain how to use Timer as Frequency divider.   **10**

5. (a) Explain in detail second order low pass Butterworth Filter.   **10**
    (b) Design astable multivibrator using IC555 for frequency of 1 KHz duty cycle = 70%.   **10**
         What changes you will incorporate in your ckt. for duty cycle of 50%.

6. (a) Design low voltage regulator using IC723 for the following specifications   **10**
         V_0 = 5 V I_{1max} = 70 mA
         V_i (unregulated i/p) = 9 ±10% V
         How will you boost the current to a level of 1 amp.
    (b) Explain successive approximation type of ADC.   **10**

7. Write short notes on (any **three**) :—   **20**
         (a) Op-amp as Schmitt Trigger.
         (b) Internal Architecture of IC555.
         (c) Practical Integrator.
         (d) Active and Passive Filter.

(3 Hours)
[Total Marks : 100]

Data structure & Algorithms,
S.E./I.T./Sem-III

N.B. : (1) Question No. 1 is **compulsory**.
 (2) Answer any **four** questions from Question No. 2 to 7.

1	a)	What are linear and non-linear data structures?	20
	b)	Why is it necessary to analyze an algorithm?	
	c)	What are Asymptotic notation	
	d)	What is an Abstract data type?	
2	a)	Explain how a stack can be used to execute computation of mathematical expressions. For example consider the expression (a + b) * (b - c).	10
	(b)	Write a program to create single link list and display the list.	10
3	(a)	Explain Map Abstract data type.	10
	(b)	What are circular and priority queues.	10
4	(a)	What is a Binary search tree. Suppose the following list of letters is inserted in order into an empty BST J R D G T E M H P A F Q . Find the final tree.	10
	(b)	Write a program to create a binary tree and inorder, preorder and post order traversal of the tree.	10
5	(a)	Explain selection sort and write a program to implement selection sort.	10
	(b)	Write an algorithm and explain with an example radix sort method.	10
6	(a)	Find out the minimum cost spanning tree for below graph using Kruskals and Prims method.	10

	(b)	Write any pattern matching algorithm and explain it with suitable example	10
7		Write short notes on any four :-	20
	b)	Red-Black trees	
	c)	Text compression	
	d)	Graph Traversals	
	e)	Recursion	
	f)	Comparison of sorting algorithms.	
	g)	Searching algorithm	

(3 Hours)

[Total Marks : 100]

Digital Logic Design & Application

N.B. : (1) Question No. 1 is **compulsory**.
  (2) Attempt any **four** out of the remaining questions.
  (3) **Figures** to the **right** indicate **full** marks.
  (4) Assume **suitable** data whenever **necessary**.

1. (a) Convert $(45.3)_7$ to BCD , Excess-3, and Gray Code. State Demorgan's Theorem 5

  (b) Write the Hamming code for 1101 5

  (c) Justify, NAND gate is a Universal Logic Gate 5

  (d) Design a Full ADDER Using suitable Decoder 5

2. (a) Given the Logic Expression

$$AB + A\overline{\overline{C}} + C + AD + A\overline{B}C + ABC$$ 10

  i) Express in Standard SOP & POS form
  ii) Draw the K- Map for the equation
  iii) Minimize and realize using NAND gates only.

 (b) Minimize using Quine Mc Cluskey's Method . 10

  $F(A, B, C, D) = \sum m (0 ,1 ,3 ,5 ,7 ,9 ,11 ,14 ,) + d (2 ,14).$

3 (a) Design a two bit Magnitude Comparator circuit using Gates 10

 (b) Design a BCD to Seven segment Display Decoder 10

4. (a) Implement the following expression using only one 4:1 MUX 10

  $F(A, B, C, D) = \sum m (0 ,1 ,5 ,7 ,8 ,13 ,14 ,)$

 (b) Design Full Substractor using two half Substracator 10

5. (a) Explain the working of Master Slave JK Flip Flop. Explain how race condition is 10
  overcome by it.

 (b) Convert :
  i) J K to D F/F   ii) D to T F/F

5. (a) Explain the working of Master Slave JK Flip Flop. Explain how race condition is overcome by it.　　10
   overcome by it.

   (b) Convert :
   i) J K to D F/F　　　　　　　　　　　ii) D to T F/F

6) (a) What is Shift Register ? Explain 4-bit bidirectional Shift Register.　　10

   (b) Draw a 4 bit Johnson Counter using shift register and prove that it is " Divide by 4" logic .　　10

7) Write short notes on any three of the following　　20
   a) VHDL features　　　　　　　　b) PAL and PLA

   c) Octal to Binary encoder　　　　d) Parity Generator

   e) Self Complementing code.