

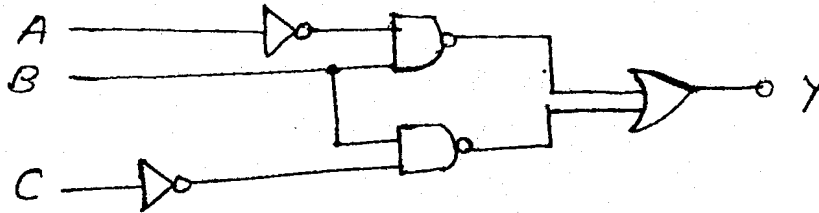
(3 Hours)

[Total Marks : 100]

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

(2) Attempt any four questions out of remaining six questions.

1. (a) Convert $(650.17)_8$ into decimal, binary and hex. 6
 (b) Explain ALU with the help of block diagram. 6
 (c) State and explain distributive and associative law for boolean equation. 4
 (d) Determine the truth table for the circuit given below-- 4



2. (a) Design 16 : 1 MUX using 4 : 1 MUX. 10
 (b) Simplify using K-map, obtain SOP equation and realise only by using NAND gates. 10
 $f(A, B, C, D) = \pi M(1, 2, 3, 8, 9, 10, 11, 14) + d(7, 15)$
3. (a) Using Quine McCluskey method, determine the minimal SOP form for : 10
 $F(A, B, C, D, E, \bar{F}, G) = \sum m(20, 28, 38, 39, 52, 60, 102, 103, 107)$
 (b) Design a BCD adder using 4-bit binary adders and explain. 10
4. (a) What is shift register ? Explain 4 bit bidirectional shift register. 10
 (b) Design a MOD-6 synchronous up-counter and explain its operation. 10
5. (a) Implement the following expression using 8 : 1 MUX. 10
 $f(A, B, C, D) = \sum m(0, 1, 3, 6, 9, 11, 12, 13, 15)$
 (b) Explain with a neat diagram 2 input TTL NAND gate in detail. 10
6. (a) Convert T flip-flop to D flip-flop. 10
 (b) Compare the different logic families with respect to the following parameters : 10
 Fan in, Fan out, Noise margin, speed and power dissipation.
7. Write short notes on :- 20
 (a) Decade Counters
 (b) Demorgan's theorems
 (c) Race around condition.

7/12/11

SE CMPN Sem-III (Reg)
Electronics: Devices &
Linear Circuit

VT-Sept.-11- 138

Con. 6190-11.

MP-4102

(3 Hours)

[Total Marks : 100

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

(2) Attempt any **four** questions out of the remaining **six** questions.

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

(4) Assume **suitable** data wherever **necessary** and mention.

1. (a) Draw r_e model for CE amplifier configuration. 5
(b) Sketch the transfer curve for p channel device with $I_{DSS} = 4 \text{ mA}$, $V_p = 3 \text{ V}$. 5
(c) Draw the trigger input and output waveforms for IC555 monostable multivibrator. 5
(d) How to calculate h parameter using graphical method. (only one parameter). 5
2. (a) Consider a simple CE configuration. Draw h parameter equivalent for the same. 15
(b) Give a table of typical values of h parameters for CE configuration for a transistor. 5
3. (a) Draw a simple block diagram of feedback amplifier. 10
What are the characteristics/improvements of negative feedback ?
(b) Explain with the help of block diagram, four different types of feedback amplifier connections. 10
4. (a) Draw common drain (CD) amplifier or source follower configuration. 5
Justify the name source follower.
(b) Draw input and output waveforms for the above. 5
(c) Explain a voltage regulator of a particular voltage and current limit of your choice. 10
Draw the block diagram.
5. (a) Draw :- 10
(i) Open loop configuration
(ii) Closed loop configuration.
with respect to op amp. Compare the above with respect to -
(i) Feedback
(ii) Ideal and practical gain.
(b) Draw and explain equivalent circuit of an ideal op amp. 10
6. (a) Explain the terms CMRR, PSRR. 5
(b) Give typical practical values for IC741C for the above. 5
(c) Draw the ideal inverting comparator. What are the practical drawbacks of such a circuit ? 5
(d) Explain practical integrator with $V_i = 5 \sin \omega t$ as input signal. 5
7. (a) Draw comparator and its input and output waveforms. 5
(b) Draw Schmitt Trigger circuit and its waveforms. 5
(c) Explain astable multivibrator with IC555 to generate output as square wave with 10
50% duty cycle.
Take frequency = 5 kHz.

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

1. (a) A block set-associative cache consists of 64 blocks divided in 4 block sets. The main memory contains 4096 blocks, each consisting of 128 words of 16 bit length :- 10
(i) How many bits are there in main memory ?
(ii) How many bits are there in each of the TAG, SET and WORD fields ?
(b) Explain Static data flow computers and Dynamic data flow computer organization with diagram. 10
2. (a) In two level memory, $t_{A1} = 10^{-7}S$ and $t_{A2} = 10^{-2}S$. What must the hit ratio it be in order for the access efficiency to be at least 90% of its maximum possible value ? 10
(b) Write and explain the microprogram for LOAD AC. 10
3. (a) Perform division of the following numbers using restoring division :- 10
Dividend = 17; Divisor = 03.
(b) Explain I/O processor and I/O channels with diagram. 10
4. (a) Explain the floating point representation IEEE standard 754. 10
(b) Explain Bus Arbitration Schemes with diagram. 10
5. (a) Explain Array Processor with diagram. 10
(b) Assume a magnetic disk has following characteristics :- 10
(i) 10,000 rpm spin rate
(ii) 2 ms head to head switching rate
(iii) 3 ms T/T seek time.
(iv) 5 platters, 1024 tracks per side, 50 sectors per track
(v) Size of a sector is 512 bytes.
Compute :-
(i) Average capacity of disk,
(ii) Average random access time.
6. (a) What is locality of reference ? Explain the different types of locality. Explain the performance characteristic of two level memory with respect to cost, access time and performance. 10
(b) Explain the different mapping techniques of cache memory. 10
7. Solve any **four** :-
(a) Write short notes on Inter-leaved memory 5
(b) Explain difference between SRAM and DRAM 5
(c) RAID 5
(d) Digital Versatile Disk (DVD) 5
(e) Comparison of RISC and CISC. 5

21/12/2011

SE (Comp) Sem III (Rev)
Discrete Structure & Proof Theory

Con. 6773-11.

MP-4117

(3 Hours)

[Total Marks : 100

- N.B. : (1) Question No.1 is compulsory.
(2) Answer any four out of remaining six questions.
(3) Assumptions made should be clearly stated.
(4) Assume any suitable data wherever required but justify the same.
(5) Figures to the right indicate marks.
(6) Illustrate answer with sketches wherever required.

Q. 1(a)

A survey on a sample of 25 new cars being sold of a local auto dealer was conducted to see which of three popular options, air conditioning A, radio R, and power windows W, were already installed. The survey found,

- 15 had air conditioning
- 12 had radio
- 11 had power windows
- 5 had air conditioning and power window
- 9 had air conditioning and radio
- 4 had radio and power windows
- 5 had all three options.

Find the no. of cars having:

- (i) only one of these options
- (ii) radio & power windows but not air conditioning
- (iii) none of these options.

6

4

(b) Explain the following terms with suitable example:

- (i) Disjoint set
- (ii) Symmetric difference
- (iii) Partition set
- (iv) Cartesian product.

6

(c) Given $A = \{1, 2, 3, 4\}$ and $B = \{x, y, z\}$. Let R be the following relation from A to B:

$$R = \{(1, y), (1, z), (3, y), (4, x), (4, z)\}$$

- (i) Determine the matrix of the relation.
- (ii) Draw the arrow diagram of R.
- (iii) Find the inverse relation R^{-1} of R.
- (iv) Determine the domain and range of R.

4

(d) Prove by mathematical induction that $6^{n+2} + 7^{2n+1}$ is divisible by 43 for each +ve integer n.

[TURN OVER

Q.2(a)

Write English sentences for following where :

$P(x)$: x is even, $Q(x)$: x is prime, $R(x, y)$: $x + y$ is even

(i) $\exists x \forall y R(x, y)$

(ii) $\forall x \exists y R(x, y)$

(iii) $\sim (\exists x R(x))$

(iv) $\sim (\forall x Q(x))$

(v) $\forall x \exists y R(x, y)$

(vi) $\exists x \forall y R(x, y)$

(vii) $\forall x (\sim Q(x))$.

⑦

(b) Show that if 30 dictionaries in a library contain total of 61,327 pages, then one of the dictionaries must have at least 2045 pages.

⑥

(c)

Let $G = \{0, 1, 2, 3, 4, 5\}$

(i) Prepare composition table with respect to '+₆'

(ii) Prove that G is an abelian group with respect to '+₆'

(iii) Find the inverse of 2, 3 and 5.

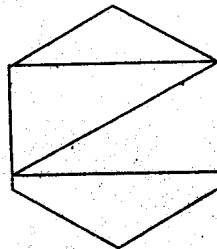
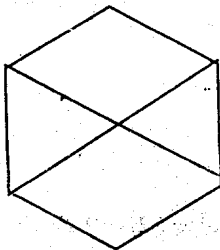
(iv) Is it cyclic?

(v) Find the order of 2, 3 and sub groups generated by these elements.

⑦

⑥

Q.3(a) Determine whether following graphs are isomorphic:



(b) $(x_1 \wedge x_2) \vee (x_1 \wedge x_3) \vee (x_2 \wedge x_3)$ be the Boolean expression. Write $E(x_1, x_2, x_3)$ in Disjunctive & Conjunctive Normal Form.

⑦

(c) $f: R \rightarrow R$ is defined as $f(x) = x^3$

$g: R \rightarrow R$ is defined as $f(x) = 4x^2 + 1$

$h: R \rightarrow R$ is defined as $h(x) = 7x - 1$

find the rule of defining $(hog)of, go(hof)$.

⑦

Q.4 (a) Explain the Eulerian & Hamiltonian path & circuit with suitable example.

⑥

(b) What is the hamming distance? Consider $(3,8)$ encoding function $e: B^3 \rightarrow B^8$ defined by

⑦

$e(000) = 00000000$

$e(100) = 10100100$

$e(001) = 10111000$

$e(101) = 10001001$

$e(010) = 00101101$

$e(110) = 00011100$

$e(011) = 10010101$

$e(111) = 00110001$

and let d be the $(8,3)$ maximum likelihood decoding function associated with e . How many errors can (e, d) correct?

(c) Determine whether D_{625} is a Boolean algebra. Justify your answer.

⑦

Q.5(a)

A function $f: \mathbb{R} - \left\{ \frac{7}{3} \right\} \rightarrow \mathbb{R} - \left\{ \frac{4}{3} \right\}$ is defined as:

$$f(x) = \frac{4x-5}{3x-7}$$

Prove that 'f' is bijective and find the rule for f^{-1} .

(b) Let $A = \{1, 2, 3, 4, 6\}$ and let R be the relation on A defined by "x divides y" written x/y .
(Note x/y if there exists an integer z such that $xz=y$.)

(i) Write R as a set of ordered pairs.

(ii) Draw its directed graph.

(iii) Find the inverse relation of R.

(c) Let $A = \{11, 12, 13, 14\}$ and let $R = \{(11, 12) (12, 13) (13, 14) (12, 11)\}$. Find transitive Closure of R using warshall's algorithm.

Q.6(a) Let R be the following equivalence relation on the set $A = \{1, 2, 3, 4, 5, 6\}$:

$$R = \{ (1, 1), (1, 5), (2, 2), (2, 3), (2, 6), (3, 2), (3, 3), (3, 6), (4, 4), (5, 1), (5, 5), (6, 2), (6, 3), (6, 6) \}$$

Find the partitions of A induced by R, i.e., find the equivalence classes of R.

(b) Define a lattice. Let $X = \{1, 3, 5, 15, 30, 60, 90, 180\}$ with the relation of divisibility.

Draw the hasse diagram for it. Whether it is a lattice? Justify your answer.

Find the complements of all the elements.

(c) Determine the sequence whose recurrence relation is $a_n = 4a_{n-1} + 5a_{n-2}$ with $a_1 = 2$ & $a_2 = 6$.

Q. 7(a) Explain various operations on the binary trees.

(b) Verify whether (Use laws of logic)

$$((P \vee Q) \wedge \neg(\neg P \wedge (\neg Q \vee \neg R))) \vee (\neg P \wedge \neg Q) \vee (\neg P \wedge \neg R) \text{ is tautology.}$$

Define universal and existential quantifier with suitable example.

(c) Define a Ring & Field. Let $R = \{0, 2, 4, 6, 8\}$. Show that R is a commutative ring under addition and multiplication modulo 10. Verify whether it is field or not.

1/12/2011

SE sem - III ZMPN
maths - III

Con. 6073-11.

(REVISED COURSE)

MP-4114

(3 Hours)

[Total Marks : 100

- N.B. 1. Question No. 1 is compulsory.
2. Attempt any FOUR from remaining six questions.
3. Figures to the right indicate the full marks.
4. Assume the suitable data if needed with justification.

Q.1 a. Find the Z-transform of $f(k) = \frac{3^k}{k} \quad k \geq 1$ 05

b. Prove that every skew-hermitian matrix A can be expressed as $B + iC$ where B is real skew-symmetric and C is real symmetric matrix. 05

c. Find the complex form of Fourier series of $f(x) = \cosh 2x + \sinh 2x$ in $(-5, 5)$ 05

d. Show that $L\{f(t)\} = e^{-as} \overline{g(s)}$ 05

$$\text{Where } \begin{cases} f(t) = g(t-a) & t > a \\ = 0 & t < a \end{cases}$$

And hence find $L\{f(t)\}$

For $f(t) = e^{3t} \cdot g(t)$ where;

$$\begin{cases} g(t) = (t-4)^2 & t > 4 \\ = 0 & t < 4 \end{cases}$$

Q.2 a. Find the Fourier series of $f(x)$ where, 06

$$f(x) = 0 \quad -2 < x < -1$$

$$= k \quad -1 < x < 1$$

$$= 0 \quad 1 < x < 2$$

b. Find all possible values of 'k' for which rank is A is 1, 2, 3. 06

$$\text{Where } A = \begin{bmatrix} k & 4 & 4 \\ 4 & k & 4 \\ 4 & 4 & k \end{bmatrix}$$

c. (i) If $J_0(t) = \sum_0^{\infty} \frac{(-1)^r}{(r!)^2} \left(\frac{t}{2}\right)^{2r}$ find $L\{J_0(t)\}$ 05

(ii) Find $L\{(1+te^{-t})^3\}$ 03

Q.3 a. Define orthogonal matrix 06

If 'A' is an orthogonal matrix then prove that $|A| = \pm 1$

Also find whether the matrix A is orthogonal or not? Where

$$A = \begin{bmatrix} \cos \alpha & 0 & \sin \alpha \\ 0 & 1 & 0 \\ -\sin \alpha & 0 & \cos \alpha \end{bmatrix}$$

b. Find the Fourier series of 06

$$f(x) = -x \quad 0 \leq x \leq \pi$$

$$= 2\pi - x \quad \pi \leq x \leq 2\pi$$

hence deduce that $\frac{\pi^2}{96} = \frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \dots$

c. Find the Laplace inverse of 08

(i) $\cot^{-1} s$

(ii) $\frac{(s+1)e^{-s}}{s^2 + s + 1}$

Q.4 a. Find Z- inverse transform of 06

$$\frac{z}{z-a} \text{ for } |z| < a, \text{ and for } |z| > a \text{ given } a > 0$$

b. Using convolution theorem find, 06

$$L^{-1} \left\{ \frac{s^2}{(s^2 + a^2)(s^2 + b^2)} \right\} \text{ and verify it.}$$

c. Find the values of 'k' for which the equations 08

$x + y + z = 1; x + 2y + 3z = k; x + 5y + 9z = k^2$ have a solution. Also find it for these values of k

Q.5 a. Examine whether the vectors $[1,0,2,1], [3,1,2,1], [4,6,2,-4], [-6,0,-3,-4]$ 06

are linearly dependent or independent.

b. Find the Laplace transformation of 06

$$f(t) = \frac{t}{a} \quad 0 < t < a$$

$$= \frac{1}{a}(2a - t) \quad a < t < 2a$$

Where $f(t) = f(t + 2a)$

c. Express the function 08

$$f(x) = 1 \quad |x| < 1$$

$$= 0 \quad |x| > 1$$

as a Fourier integral and hence evaluate, $\int_0^{\infty} \frac{\sin \omega \sin \omega x}{\cos \omega} d\omega$

Q.6 a. Show that the fourier transform of $f(x) = e^{-\frac{x^2}{2}}$ is given by, 06

$$F(s) = e^{-\frac{s^2}{2}}$$

b. Find $Z\{f(k)\}$ where $f(k) = \frac{1}{2^k} * \frac{1}{3^k}$ for $k \geq 0$ 06

c. Find the fourier series of 08

$$f(x) = 0 \quad \text{for } -\pi < x < 0$$

$$= \sin x \quad \text{for } 0 < x < \pi$$

Hence deduce that $\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \frac{1}{7.9} + \dots = \frac{1}{2}$

Q.7 a. Test for the consistency the following equations 06

And if possible solve them

$$x + 2y - z = 1$$

$$x + y + 2z = 9$$

$$2x + y - z = 2$$

b. Solve: 06

$$3 \frac{dy}{dt} + 2y = e^{3t} \quad \text{where } y = 1 \text{ at } t = 0$$

c. Show that the set of functions, 08

$1, \sin x, \cos x, \sin 2x, \cos 2x, \dots$ is orthogaonal on $(0, 2\pi)$ but not on $(0, \pi)$

12/12/11

SE COMPN

Sem-III
Data Structure & Files

vs Sept-2011-177

Con. 6386-11.

MP-4112

[Total Marks : 100

(3 Hours)

- N. B. :**
- (1) Question No. 1 is **compulsory**.
 - (2) Attempt any **four** questions out of the remaining **six** questions.
 - (3) Assumptions made should be **clearly** stated.
 - (4) **Figures** to the **right** indicate marks for **each** question.
 - (5) Assume **suitable** data wherever **required**.

1. (a) What is recursion ? State its advantages and disadvantages. 5
(b) What is AVL tree ? Explain with example. 5
(c) Define : 5
 (i) Abstract Data Type
 (ii) Binary Tree
 (iii) Graph.
(d) Construct Huffman code for "C++ JAVA". 5
2. (a) Explain different types of "Tree Traversal" Techniques. Explain each with suitable example. 10
(b) Explain different ways to represent a graph. Give example. 10
3. (a) Write a program to implement queue using array. 10
(b) Explain any two application of stack using program. 10
4. (a) Explain the working of Merge sort. And, sort the following elements – 10
 50, 10, 20, 40, 5, 60, 35
(b) Explain circular and priority queue. 10
5. (a) Write a program to create a doubly linked list and perform the following operations : 9
 (i) insert into the list
 (ii) delete from the list
 (iii) search for a data.
(b) Write a program in Java that reads a text file and counts occurrences of a particular word. 11
6. (a) What is Hashing ? Hash the following in a table of size 11. Use any two collision resolution techniques. 10
 20, 5, 10, 11, 22, 33, 40, 50, 30, 51, 31.
(b) Construct binary tree for inorder and postorder traversal sequence given below. 10
 inorder : "INFORMATION"
 postorder : "INOFMAINOTR"

7. Write short notes on any **four** of the following :-

- (a) Comparison of sorting Algorithm
 - (b) B+ trees
 - (c) Binary Search
 - (d) Prefix and postfix forms of expressions
 - (e) Asymptotic notation
 - (f) Tower of Hanoi.
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