

S.E. sem-III CBN M-2014

Sub-ECCF. COMP

22/5/14

QP Code : NP-18652

(3 Hours)

[Total Marks : 80

- N. B. : (1) Questions No. 1 is compulsory.
(2) Solve any three questions out of remaining questions.
(3) Draw neat and clean diagrams.
(4) Assume any suitable data if required.

1. (a) Explain input offset voltage, CMRR and SVRR for operational amplifier. 5
(b) Explain Barkhausen's criteria for principle of oscillation. 5
(c) Explain principle of FDM. 5
(d) Compare FM and AM. 5
2. (a) Sketch a typical drain characteristics for $V_{GS} = 0$ for an n-channel JEFET. 10
Explain the shape of the characteristics, identify regions and indicate the important current and voltage levels.
(b) Explain class C BJT power amplifier in detail. Compare it with class A BJT power amplifier. 10
3. (a) Explain amplitude modulation for more than one modulating signal in following cases 10
(i) Mathematical equation
(ii) AM waveform
(iii) Amplitude and power spectrum
(iv) Modulation coefficient
(v) Transmission power
(b) Explain with block diagram AM superheterodyne receiver. 10
4. (a) Explain ideal as well as practical differentiator using operational amplifier in detail. 10
(b) The antenna current of an AM broadcast transmitter, modulated to a depth of 40% by an audio sine wave is 11 A. It increases to 12 A as result of simultaneous modulation by another audio sine wave. What is the modulation index due to this second wave? 10
5. (a) State sampling theorem. What happens if the sampling is done at less than $2f_{max}$. 10
(b) What is multiplexing in communication system? Draw block diagram of TDM-PCM System and explain?. 10

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6. (a) Explain PLL as a frequency synthesizer. 5
- (b) Explain operating principle of PLL. 5
- (c) List different types of ADC's and explain binary weighted ADC in detail. 10
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(3 hours)

Total Marks: 80

N.B.

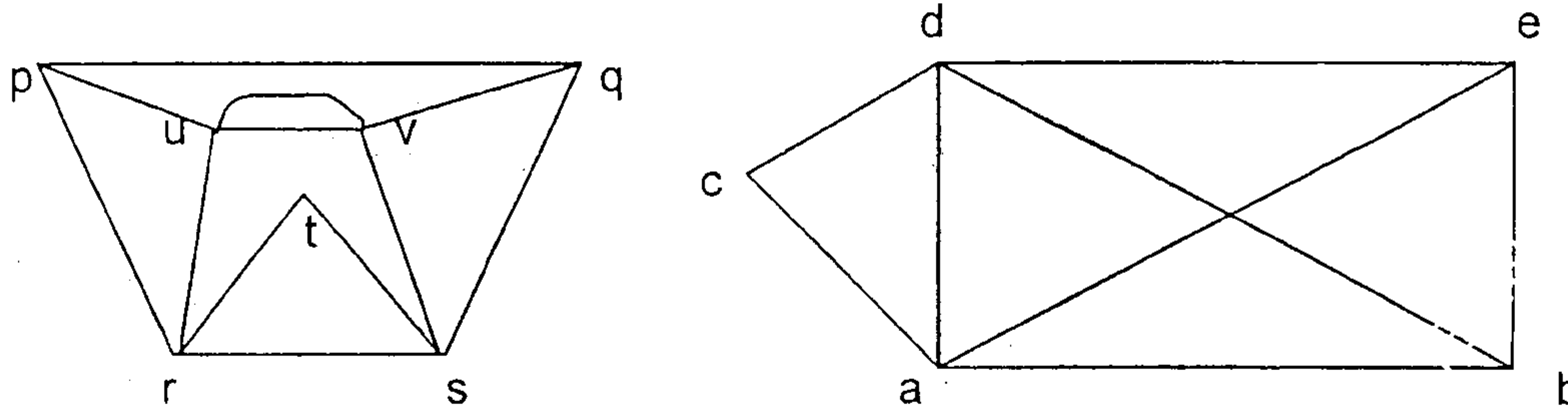
1. Question No 1 is compulsory
2. Solve any three question out of remaining five questions
3. Assumption made should be clearly stated
4. Figure to the right indicates full marks

- 1 (a) Prove that $8^n - 3^n$ is a multiple of 5 by mathematical induction, $n \geq 1$ 5
- (b) Show that if a relation on set A is transitive and irreflexive, then it is asymmetric. 5
- (c) Function $f(x) = (4x + 3)/(5x - 2)$. Find f^{-1} 5
- (d) What is the total number of vertices in a full binary tree with 20 leaves? 5
- 2 (a) Let $f(x) = x + 2$, $g(x) = x - 2$ and $h(x) = 3x$ for all $x \in R$. (R is the set of real number). Find i) $f \circ g \circ h$ ii) $h \circ g \circ f$ iii) $f \circ f \circ f$ 8
- (b) Let R be a relation on the set of integers Z defined by aRb if and only if $a \equiv b \pmod{5}$. Prove that R is an equivalence relation. Find Z/R . 8
- (c) Show that $A \times (B \cap C) = (A \times B) \cap (A \times C)$ 4
- 3 (a) Let $A = \{1, 2, 3, 4\}$ and $R = \{(1,2), (2,3), (3,4), (2,1)\}$. Find the transitive closure using Warshall's algorithm. 6
- (b) Consider the lattices $L1 = \{1, 2, 4\}$, $L2 = \{1, 3, 9\}$ under divisibility. Draw the lattice $L1 \times L2$. 7
- (c) Solve the recurrence relation $a_n = -3(a_{n-1} + a_{n-2}) - a_{n-3}$ with $a_0 = 5$, $a_1 = -9$ and $a_2 = 15$ 7
- 4 (a) Show that a group G is abelian if and only if $(ab)^2 = a^2b^2$ for all $a, b \in G$ 6
- (b) Prove that the set $G = \{1, 2, 3, 4, 5, 6\}$ is an abelian group under multiplication modulo 7. 6
- (c) Find the generating function for the following series 8
- i) $\{0, 1, 2, 3, 4, \dots\}$
- ii) $\{1, 2, 3, 4, 5, \dots\}$
- iii) $\{2, 2, 2, 2, 2, \dots\}$
- iv) $\{0, 0, 0, 1, 1, 1, 1, \dots\}$
- 5 (a) Let $H = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ be parity check matrix. 8
- Decode the following words relative to maximum likelihood decoding function.
- i) 011001 ii) 101011 iii) 111010 iv) 110110

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(b) Determine the Eulerian and Hamiltonian path, if exists, in the following graphs:

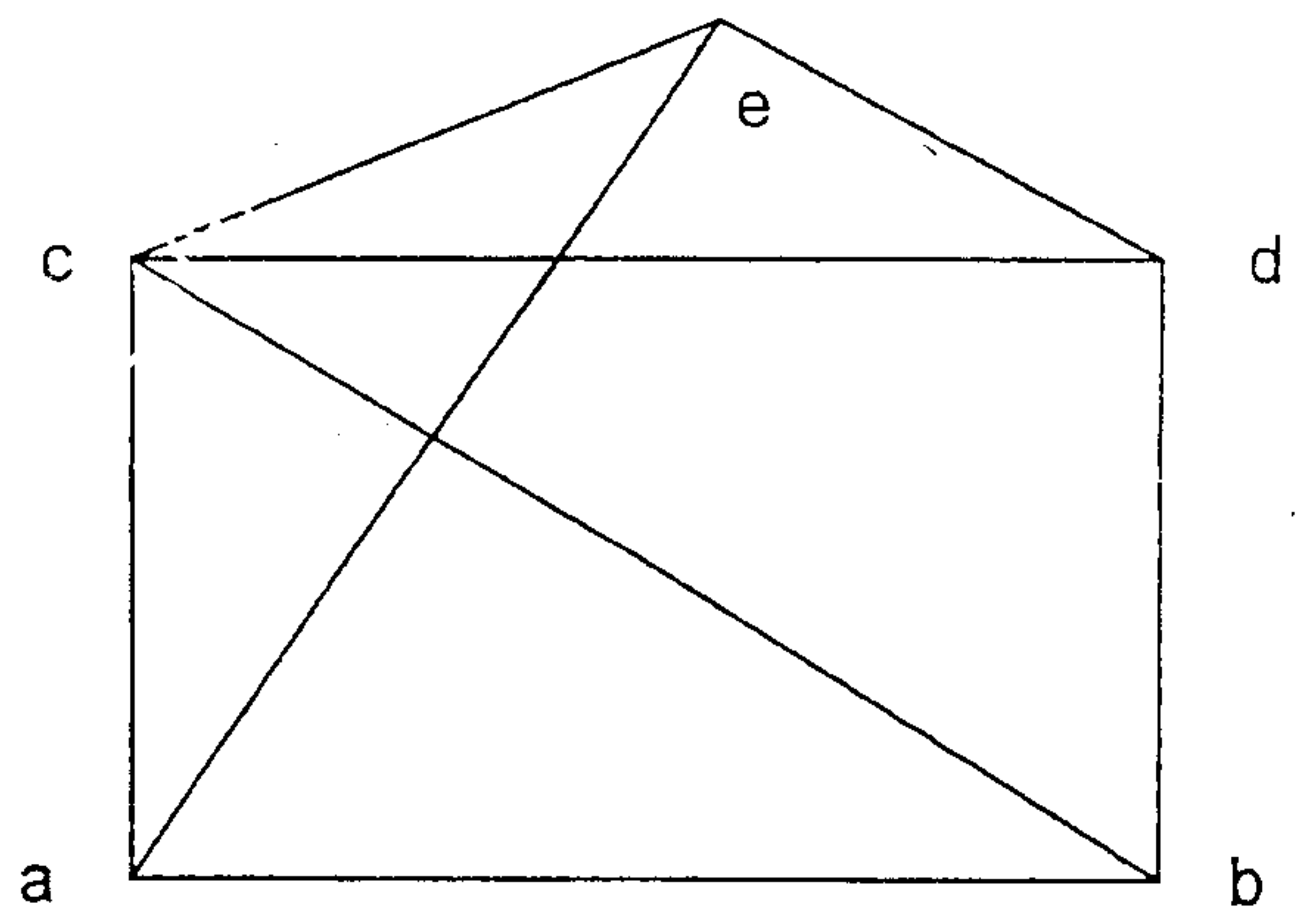
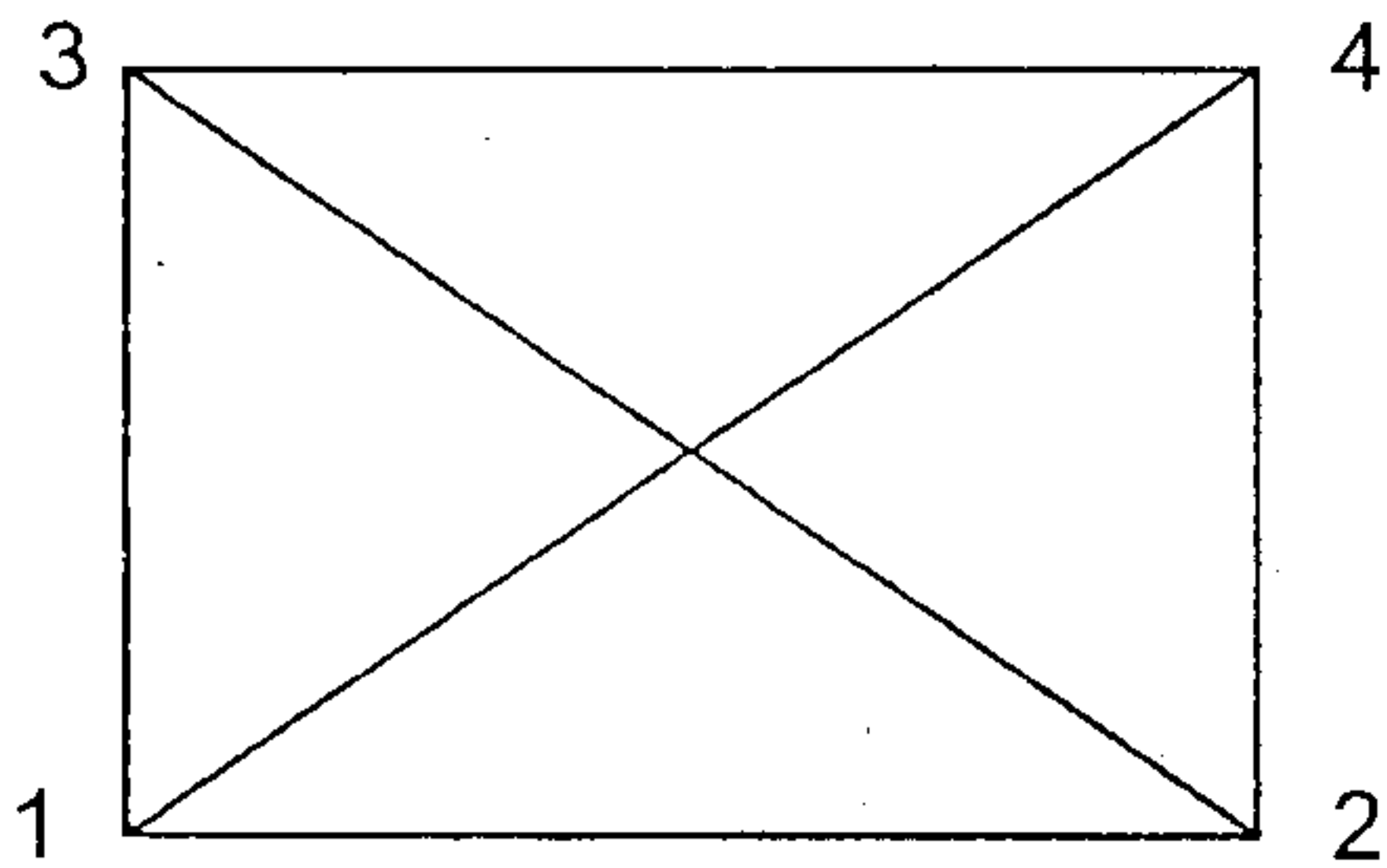
6



(c) Let G be the set of real numbers and let $a * b = ab/2$. Show that $(G, *)$ is an abelian group.

6

6 (a)



8

(b) Use the laws of logic to determine the following expression as tautology or contradiction.

6

$$[p \wedge (p \Rightarrow q)] \Rightarrow q$$

(c) Draw the Hasse Diagram of the following:

6

a) D_{105}

b) D_{72}

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(3 Hours)

[Total Marks :80

- N.B. :** (1) Question no. 1 is **compulsory**.
 (2) Solve any 3 questions from remaining questions.
 (3) Assume suitable data wherever **necessary**.

1. (a) Explain different types of data structures with example. 5
 (b) Write recursive & non-recursive functions to calculate GCD of 2 numbers. 5
 (c) Show with example how graphs are represented in computer memory. 5
 (d) Discuss practical application of trees. 5
2. (a) What is hashing? What is mean by collision? Using modulo division method & linear probing, store the values given below in array with 10 elements. 10
 99 33 23 44 56 43 19.
 (b) Write a program in 'C' to convert infix expression to postfix expression using stacks. 10
3. (a) Write a program in 'C' to perform Quick sort. show steps with example. 10
 (b) Write a program in 'C' which will read a text and count all occurrences of a particular word. 10
4. (a) Write a program in 'C' to implement circular queue using Link-list. 10
 (b) Construct Binary tree for the pre order & Inorder traversal sequences: 10
- | | | | | | | | | | |
|-----------|---|---|---|---|---|---|---|---|---|
| Preorder: | A | B | D | G | C | E | H | I | F |
| Inorder: | D | G | B | A | H | E | I | C | F |
5. (a) Write a program in 'C' to implement Doubly Link-list with methods insert, delete and search. 10
 (b) Write a program in 'C' to implement Binary search on sorted set of integers. 10
6. Write short note on:—
- (a) Discuss Threaded Binary tree in detail. 10
 (b) Explain BFS algorithm with example. 10

SE / COMPN / III CBAS

3/6/2014.

DLD A

QP Code : NP-18720

(3 Hours)

[Total Marks : 80

- N.B. :** (1) Question No. 1 is compulsory.
(2) Solve any **three** questions from remaining.
(3) **Figures** to the right indicate full marks.
(4) Assume **suitable** data if necessary.

1. (a) Perform following without converting into other bases. 5
(i) $(57)_8 * (24)_8$ (ii) $(312.0)_4 + (213.2)_4$
(b) Define following Parameters for CMOS family :— 5
(i) Fan out (ii) Fan in.
(c) Design a full adder using half adder and additional gates. 5
(d) Explain concept of bistable multivibrators. 5
2. (a) Using Quine MC Clusky method determine minimal SOP form for : 10
 $F(A, B, C, D) = \sum m (1, 2, 3, 6, 7, 10, 12, 14)$
(b) Obtain even Parity hamming code for 1010. Prove that hamming code is an error 10
detecting and correcting code.
3. (a) Explain the operation of 4-bit universal shift register. 10
(b) Design a 2-bit digital comparator that accepts inputs A and B and gives three outputs 10
G, E and L.
(i) Output G, when $A > B$
(ii) Output E, when $A = B$
(iii) Output L, when $A < B$.
4. (a) Implement the following using 8:1 Mux. 10
 $F(A, B, C, D) = \pi M(1, 3, 5, 9, 11, 12, 13)$.
(b) Simplify following function using k-map. 10
 $F(A, B, C, D) = \sum m (1, 2, 3, 4, 6, 8, 10, 14, 15)$
5. (a) Design a sequence generator for following sequence. Identify and check for lock 10
out condition
 $0 \rightarrow 3 \rightarrow 5 \rightarrow 6 \rightarrow 0$.
(b) Explain 4-bit Johnson counter. Draw its timing diagram. 10
6. Attempt any two :— 20
(a) Working of Master-Slave J-K flip flop.
(b) Details and comparison of FPGA and CPLD.
(c) Convert the following :—
(i) SR to JK (iii) JK to D
(ii) SR to D (iv) JK to SR.

SE comp

SE IT III

Applied Mathematics - III 31 May 2014

(CBGS)

(CBGS)

QP Code : NP-18619

(3 Hours)

[Total Marks : 80

- N.B. : (1) Question No.1 is compulsory.
(2) Attempt any three questions from Question No.2 to Question No.6.
(3) Non-programmable calculator is allowed.

1. (a) Find $L^{-1}\left[\frac{Se^{-\pi s}}{S^2 + 2S + 2}\right]$ 5

(b) State true or false with proper justification "There does not exist an analytic function whose real part is $x^3 - 3x^2y - y^3$ ". 5

(c) Prove that $f_1(x) = 1$, $f_2(x) = x$, $f_3(x) = \frac{(3x^2 - 1)}{2}$ are orthogonal over $(-1, 1)$. 5

(d) Using Green's theorem in the plane, evaluate $\int_C (x^2 - y)dx + (2y^2 + x)dy$ around the boundary of the region defined by $y = x^2$ and $y = 4$. 5

2. (a) Find the fourier cosine integral representation of the function $f(x) = e^{-ax}$, $x > 0$ 6

and hence show that $\int_0^{\infty} \frac{\cos ws}{1+w^2} dw = \frac{\pi}{2} e^{-x}$, $x \geq 0$.

(b) Verify laplaces equation for $U = \left(r + \frac{a^2}{r}\right) \cos \theta$ Also find V and $f(z)$. 6

(c) Solve the following eqn. by using laplace transform. $\frac{dy}{dt} + 2y + \int_0^t y dt = \sin t$ given that $y(0) = 1$. 8

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2087

QP Code : NP-18619

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3. (a) Expand $f(x) = \begin{cases} \pi x, & 0 < x < 1 \\ 0, & 1 < x < 2 \end{cases}$ with period 2 into a fourier series. 6

(b) A vector field is given by $\vec{F} = (x^2 + xy^2)\mathbf{i} + (y^2 + x^2y)\mathbf{j}$ show that \vec{F} is irrotational and find its scalar potential. 6

(c) Find the inverse z - transform of - 8

$$f(z) = \frac{z+2}{z^2 - 2z + 1}, |z| > 1$$

4. (a) Find the constants 'a' and 'b' so that the surface $ax^2 - byz = (a + 2)x$ will be orthogonal to the surface $4x^2y + z^3 = 4$ at $(1, -1, 2)$ 6

(b) Given $L(\text{erf } \sqrt{t}) = \frac{1}{S\sqrt{S+1}}$, evaluate $\int_0^\infty t e^{-t} \text{erf}(\sqrt{t}) dt$ 6

(c) Obtain the expansion of $f(x) = x(\pi - x)$, $0 < x < \pi$ as a half-range cosine series. 8

Hence show that - (i) $\sum_1^\infty \frac{(-1)^{n+1}}{n^2} = \frac{\pi^2}{12}$

(ii) $\sum_1^\infty \frac{1}{n^4} = \frac{\pi^4}{90}$

5. (a) If the imaginary part of the analytic function $W=f(z)$ is $V = x^2 - y^2 + \frac{x}{x^2 + y^2}$ find the real part U. 6

(b) If $f(k) = 4^k U(K)$ and $g(k) = 5^k U(K)$, then find the z- transform of $f(k) \cdot g(k)$ 6

(c) Use Gauss's Divergence theorem to evaluate $\iint_S \vec{N} \cdot \vec{F} ds$ where $\vec{F} = 4xi + 3yj - 2zk$ and S is the surface bounded by $x = 0, y = 0, z = 0$ and $2x + 2y + z = 4$. 8

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6. (a) Obtain complex form of Fourier series for $f(x) = \cosh 3x + \sinh 3x$ in $(-3, 3)$. **6**
- (b) Find the inverse Laplace transform of $\frac{(s-1)^2}{(s^2 - 2s + 5)^2}$ **6**
- (c) Find the bilinear transformation under which $1, i, -1$ from the z -plane are mapped onto $0, 1, \infty$ of w -plane. Also show that under this transformation the unit circle in the w -plane is mapped onto a straight line in the z -plane. Write the name of this line. **8**
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- N. B. :** (1) Question No. 1 is **compulsory**.
(2) Attempt any **three** from remaining.

1. (a) Write a recursive method to calculate factorial of an integer number. 5
(b) Explain Bit-wise operators available in JAVA with example. 5
(c) Explain how JAVA is platform - independent. 5
(d) Write a program to find the largest of the three integers accepted from command line. 5

2. (a) Write a detailed note on System.arraycopy(). 5
(b) Write a program to display following pattern :- 5
 1
 0 1
 1 0 1
 0 1 0 1
(c) Explain different types of inheritance with example. 10

3. (a) With proper example explain the steps to create a package and add a class or interface. 5
(b) Explain Thread life cycle. 5
(c) Write a program in JAVA to accept the values of a, b, c and d. 10
 Calculate and display $((a*d) + (b*c)) / (b*d)$.
 Create user defined exception to display proper message when value of $(b*d)$ is ZERO.

4. (a) What is Vector ? Explain any five methods of Vector. 5
(b) Explain what are abstract class and abstract methods. 5
(c) Write a program to find largest and second largest element of an array. 10

5. (a) Explain method overloading and method overriding with suitable example. 10
(b) Write a program to accept a number from command line and to check whether it is Armstrong Number or Not. 10

6. Write short notes on (any four) :- 20
 (a) Wrapper classes.
 (b) Life cycle of Applet
 (c) Static members
 (d) Thread synchronization
 (e) Exception handling mechanism.