- Sem- III - CMPN - CBSGS) - Applied Mathematics - III

Nov- 15

Q.P. Code : 5067

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

Instructions:

1) Question No. **1** is compulsory.

2) Attempt any **THREE** of the remaining.

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

Q 1. A) Find Laplace of $\{t^5 cosht\}$ (5)

B) Find Fourier series for f(x) = $1 - x^2$ in (-1, 1) (5)

C) Find a, b, c, d, e if,

f(z) = $(ax^4+bx^2y^2+cy^4+dx^2-2y^2)+i(4x^3y-exy^3+4xy)$ is analytic (5)

D) Prove that $\nabla\left(\frac{1}{r}\right) = -\frac{\bar{r}}{r^3}$ (5)

Q.2) A) If f(z)= u + iv is analytic and u + v = $\frac{2\sin 2x}{e^{2y}+e^{-2y}-2\cos 2x}$, find f(z) (6)

B) Find inverse Z-transform of f(z) = $\frac{z+2}{z^2-2z+1}$ for $|z| > 1$ (6)

C) Find Fourier series for f(x) = $\sqrt{1-cosx}$ in $(0, 2\pi)$

Hence, deduce that $\frac{1}{2} = \sum_1^\infty \frac{1}{4n^2-1}$ (8)

Q.3) A) Find $L^{-1}\left\{\frac{1}{(s-2)^4(s+3)}\right\}$ using Convolution theorem (6)

B) Prove that $f_1(x) = 1$, $f_2(x) = x$, $f_3(x) = (3x^2-1)/2$ are orthogonal over (-1, 1) (6)

C) Verify Green's theorem for $\int_c \bar{F}.\overline{dr}$ where $\bar{F} = (x^2 - y^2)i + (x+y)j$ and c is the triangle with vertices (0,0), (1,1), (2,1) (8)

[TURN OVER

Q.4) A) Find Laplace Transform of $f(t) = |sinpt|$, $t \geq 0$ (6)

B) Show that $\bar{F}$ = (ysinz-sinx) i +(xsinz+2yz) j + (xycosz+y^2) k is irrotational.

Hence, find its scalar potential. (6)

C) Obtain Fourier expansion of $f(x) = x + \frac{\pi}{2}$ where $-\pi < x < 0$

$= \frac{\pi}{2} - x$ where $0 < x < \pi$

Hence, deduce that (i) $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots$

(ii) $\frac{\pi^4}{96} = \frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \ldots$ (8)

Q.5) A) Using Gauss Divergence theorem to evaluate $\iint_S \bar{N}.\bar{F}ds$ where $\bar{F} = 4xi - 2y^2j + z^2k$ and S is the region bounded by $x^2 + y^2 = 4$, $z = 0$, $z = 3$ (6)

B) Find $Z\{2^k cos(3k + 2)\}$, $k \geq 0$ (6)

C) Solve $(D^2+2D+5)y = e^{-t}sint$, with $y(0) = 0$ and $y'(0) = 1$ (8)

Q.6) A) Find $L^{-1}\left\{\tan^{-1}\left(\frac{2}{s^2}\right)\right\}$ (6)

B) Find the bilinear transformation which maps the points 2, i, -2 onto points 1, i, -1 by using cross-ratio property. (6)

C) Find Fourier Sine integral representation for $f(x) = \frac{e^{-ax}}{x}$ (8)

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Sem-III - CCBSGS) / CMPN & INFT / Object Oriented Programming Methodology - Nov'15

QP Code : 5286

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

N.B. : (1) Question no. 1 is compulsory
(2) Attempt **any three** from remaining questions.
(3) Illustrations, in-depth answers and diagrams will be appreciated.
(4) Mixing of sub-questions is not allowed.

1. (a) Explain how Java is platform-independent and high performance. 5
(b) Explain System.arraycopy ( ) 5
(c) Difference between abstract class and interface 5
(d) Write an applet program to draw circle, rectangle and polygon. 5

2. (a) Consider the Railway System : 12
(i) Stations, tracks connecting stations.
(ii) Trains with name & ID
(iii) Train schedules record the time a train passes through each station on its route. Assume that each train reaches its destination on same day and every train runs everyday For each train on its route, store (a) time in (b) time out (c) Sequence no so stations in the route of a train can be ordered by sequence no.
(iv) Passenger booking consisting of train, date, from station, to station, coach, seat and passenger name.
Draw class diagram for above scenario. Show clearly the relationship among participating classes.
(b) Draw Sequence diagram for passenger booking his ticket at irctc website. 8

3. (a) Write a program to display area of square, triangle and circle. Make use of interface to define templates of methods to be implemented in desired classes. 10
(b) Write a program to check whether the entered four digit number is vampire or not. Combination of digits from this number forms two 2-digit number. When they are multiplied by each other, we get original number. 10
eg. 1260 = 21 *60.

4. (a) In a garden, trees are maintained. A tree has following set of attributes :- 10
Tree code, height, base and amount spent on the tree so far.
Define Tree class, its constructor, display ( ) and update ( ) that updates tree information.
Define derive class Mango tree that has additional yield attribute.
Define Garden class and display information of a tree and a Mango Tree.

[TURN OVER]

(b) Write the help of suitable example. Explain multithreating in terms of following :- 10
   (i) Creating threads, extending Thread class
   (ii) Lifecycle of thread.

5. (a) Write a program to read five names of students from command line and store them in a vector. Sort list in alphabetical order and display using Enumeration interface. 8
   (b) Explain cohesion and coupling with suitable example. 8
   (c) What are recursive functions? Demonstrate the concept with fibonacci program. 4

6. Write short notes on (any **four**) : 20
   (a) Life cycle of Applet.
   (b) Static Members.
   (c) Thread Synchronization
   (d) JVM.
   (e) Collection classes.

PN / Sem-III (CBSGS) / Data Structures

QP Code : 5162

(3 Hours) **[Max Marks 80**

N.B.
(1) Question no. 1 is compulsory.
(2) Attempt any 3 from the remaining questions.
(3) Assume suitable data if necessary.
(4) Figures to right indicate full marks.

Q1(a)	Write a function to implement an HUFFMAN coding given a symbol and its frequency occurrence.	10
Q1(b)	Write a function to count the leaf nodes in Binary tree and Branch nodes in Binary tree.	10
Q2(a)	Explain Linked list as an ADT. Write a function for deletion of a node from Doubly linked list?	10
Q2(b)	What do you mean by Sparse matrix ? How one can implement sparse matrix using Linked list ? Support your answer with an example	10
Q3(a)	Explain STACK as ADT ? Write a function in C to convert prefix expression to postfix expression.	10
Q3(b)	Write a function in C to maintain 2 stacks in a single array.	10
Q4(a)	Explain Queue as ADT ? write a function in C to insert , delete and display elements in Circular Queue.	10
Q4(b)	Explain the concept of threaded binary search tree ? Show the declaration of a node in threaded binary search tree? Write a function for inorder traversal of threaded binary search tree.	10
Q5(a)	What are different methods for traversing the graph ? Explain DFS in detail with an example. Write a function for DFS.	10
Q5(b)	Write a function for creating a tree if IN-ORDER traversal and POST-OREDER traversal of a tree is given.	10
Q6(a)	Write an algorithm for Shell sort. Sort the following numbers in ascending order 23 , 12 , 45 ,54 ,76 , 67 ,88, 97 , 54 using shell sort. Show output after each pass.	10
Q6(b)	Explain Index sequential Search with an example.	

SE/Sem-III/Rev-2012/CBSGS/CMPN/Nov. 2015/ Digital Logic Design And Analysis.

QP Code : 5211

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

Instructions for the students:

1) Question number 1 is compulsory.
2) Attempt any 3 questions from the remaining 5 questions.
3) Each question carries 20 marks.

Q1(a): Convert decimal number 199.375 into binary, octal, hexadecimal system.

(b): Perform hexadecimal arithmetic operation: DADA + BABA.

(c): Convert binary data 1010 into 7 bit even parity hamming code.

(d): Express the equation in standard POS form: F (A, B, C) = Σ m (0, 2, 5,7).

(e): Differentiate in brief between combinational & sequential circuits.

(f): Compare TTL & CMOS with respect to speed, power dissipation, fan-in & fan-out.

(g): Explain in brief weighted & non-weighted codes with one example each.

(h): Explain the race around condition in JK flip-flop. State various methods to overcome it.

(i): Convert JK flip-flop into D-flip-flop & T-flip-flop (show only the design without steps).

(j): What is Modulus of the counter? For MOD-6 counter how many flip-flops are needed?

Q2(a): Simplify the following equation using K-map to obtain minimum POS equation & realize the minimum equation using only NOR gates.

F (A, B, C, D) = Σ m (1, 3, 4, 6, 9, 11, 12, 14)

(b): What is Multiplexer tree? Construct 32:1 multiplexer using 8:1 multiplexers only. Explain how the logic on particular data line is steered to the output in this design with example.

Q3(a): Reduce using Quine McClusky method & realize the equation using only NAND gates.

F(P, Q, R, S) = Σ m (0, 1, 2, 8, 10, 11, 14, 15)

(b): Implement single digit BCD adder using 4-bit binary adder IC 7483. Show the design procedure & explain its operation.

Q4 (a): Explain the concept of comparator. Develop the truth table for 2-bit binary comparator & design it using a suitable decoder & additional gates.

(b): Design MOD-5 synchronous up-counter using JK flip-flops with all the design steps.

Q5 (a): Input to a combinational circuit is a 4-bit binary number. Design the circuit with minimum hardware for the following:

- Output P = 1 if the number is prime.
- Output Q = 1 if the number is divisible by 3.

(b): Draw a circuit diagram for 3-bit asynchronous binary down counter using master-slave JK flip-flops. Show the output of each flip-flop with reference to the clock & justify that the down counting action. Also prove from the timing diagram that the counter is "divide by 8" counter.

Q6 (a): What is shift register? Explain 4-bit bidirectional shift register.

(b): Draw & explain the working of 4-bit ring counter with timing diagram.

MD-Con. 10469-15.

COMPN / Sem-III (CBSGS) / Discrete Structure - Nov-15

QP Code : 5253

(3 hours) Total Marks: 80

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

1 (a) *Show that if any seven points are chosen in a regular hexagon whose sides are of 1 unit, then two of them must be no further apart than 1 unit.* 5

(b) *Determine the number of edges in a graph with 6 nodes, 2 nodes of degree 4 and 4 nodes of degree 2. Draw two such graphs.* 5

(c) $6^{n+2} + 7^{2n+1}$ *is divisible by 43* 5

(d) *Draw the Hasse diagram of* D_{60}. *Also find whether it is a lattice.* 5

2. (a) *Define injective, surjective and bijective functions. If* $f: R \to R$ *and* $g: R \to R$ *defined by* $f(x) = x + 2$ *and* $g(x) = x^2$. *Find i)* $f \circ g \circ f$ *ii)* $g \circ f \circ g$ 6

(b) *It was found that in a class, 80 students are passed in English, 60 in Science and 50 in Mathematics. It was also found that 30 students passed in both English and Science, 15 students passed in both English and Mathematics and 20 students passed in both Mathematics and Science, 10 students passed in all three subjects. If there are 150 students in the class, find* 8

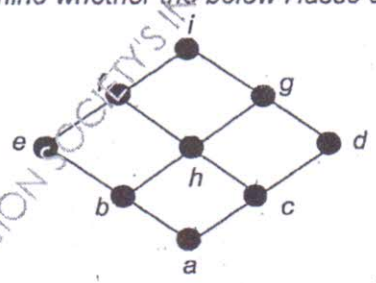
(i) *How many students passed in at least one subject?*
(ii) *How many students passed in English only?*
(iii) *How many students failed in all three subjects?*

(c) *Let* $S = \{1, 2, 3, 4, 5\}$ *and* $A = S \times S$. *Define the following relation* R *on* A : 6
$(a, b)\ R\ (c, d)$ *if and only if* $ad = bc$. *Show that* R *is an equivalence relation and compute* A/R.

3 (a) *If 11 people are chosen from a set of A={1, 2, 3, ..., 20}, then one of them is multiple of other.* 4

(b) *If* $f: A \to B$ *and If* $g: B \to C$ *are both one-one and onto, , then* $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$ 4

(c) *Determine whether the below Hasse diagram represents a lattice* 6



(d) *If* $(G, *)$ *is an Abelian group, then for all* $a, b \in G$ *show that* $(a * b)^n = a^n + b^n$. 6
(use mathematical induction).

MD-Con. 11522-15.

[TURN OVER

4 (a) Let $G = \{1, 2, 3, 4, 5, 6\}$. Prove that $(G, \times_7)$ is a finite Abelian group with respect to multiplication modulo 7. 6

(b) 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.

Determine the group code $e_H: B^2 \rightarrow B^5$

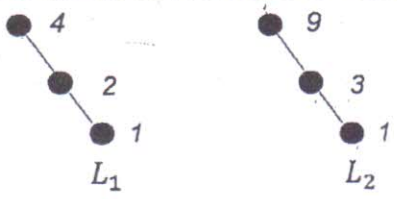
(c) Find the generating functions for the following sequence 7

i) 0, 0, 0, 1, 2, 3, 4, 5, 6, 7, ...

ii) $6, -6, 6, -6, 6, -6, 6, - \cdots$ ... ...

5 (a) If function f is an isomorphism from semigroup $(S, *)$ to $(T, *')$, then prove that f^{-1} is an isomorphism from $(T, *')$ to $(S, *)$ 5

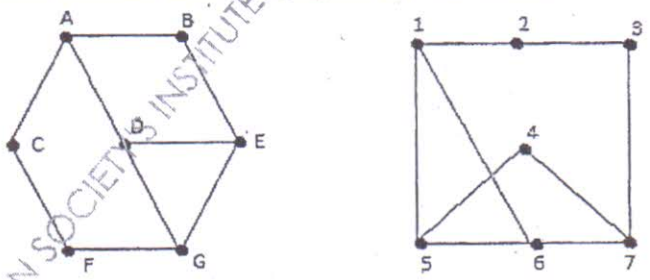
(b) Consider the chain of divisors of 4 and 9, i.e., $L_1 = \{1, 2, 4\}$ and $L_2 = \{1, 3, 9\}$



Find the Hasse diagram of $L_1 \times L_2$

(c) Show that the set $G = \{f_1, f_2, f_3, f_4, f_5, f_6\}$ where the functions are defined by $f_1(x) = x$ $f_2(x) = 1 - x$ $f_3(x) = \frac{x}{x-1}$ $f_4(x) = \frac{1}{x}$ $f_5(x) = \frac{1}{1-x}$ $f_6(x) = 1 - \frac{1}{x}$ is a group under composition of functions. Frame the composition table.

6 (a) Determine whether following graphs are isomorphic



(b) Solve the following recurrence relation :

$a_n - 5a_{n-1} + 6a_{n-2} = 2^n$ with initial conditions $a_0 = -1$ and $a_1 = 1$

(c) Show that $(\neg q \wedge (p \Rightarrow q)) \Rightarrow \neg p$ is a tautology

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EMPN / Sem - III - CBSGS / Electronic Circuits & Comm. Fundamentals

QP Code : 5115

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

N.B. : 1. Question **ONE** is **compulsory**
2. Solve any **THREE** out of remaining questions
3. Draw neat and clean diagrams
4. Assume suitable data if required.

Q. 1. A. Give reasons for the following 5

I. FET is called as a square law device

II. Barkhausens criteria should be satisfied to get oscillations

B. With neat diagram explain any one application of Zero-Crossing Detector 5

C. With neat circuit diagram explain the use of PLL as a phase shifter 5

D. Explain with suitable example what do you understand by signal multiplexing? 5

Q. 2 A. Draw and explain JFET characteristics. Also show that for a JFET

$$g_m = \frac{2}{|V_P|}\sqrt{I_{DSS} \cdot I_{DS}}$$ 10

B. With respect to op-amp explain the ideal characteristics and concept of virtual aground. Explain how op-amp can be used as an averaging amplifier in inverting configuration. Also draw neat circuit diagrams to

I. convert sine wave to square wave using op-amp.

II. detect the crossing of zero's in the generated square wave. 10

Q. 3 A. Explain how operational amplifier can be used for addition of two AC signals with one DC signal. 5

B. Explain fly wheel effect in Class C amplifier. 5

C. What is sampling theorem and state its significance in communication. What is the standard frequency for speech signal? 5

D. Determine the magnitude of g_m for a JFET with I_{DSS} = 8 mA and V_P = −4 V at the following dc bias points:

(a) V_{GS} = −0.5 V.

(b) V_{GS} = −1.5 V.

(c) V_{GS} = −2.5 V. 5

TURN OVER

MD-Con. 8333 -15.

CMPN / Sem - III - CBSGS / Electronic Circuits & Comm. Funda

QP Code : 5115

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

N.B. : 1. Question **ONE** is **compulsory**
2. Solve any **THREE** out of remaining questions
3. Draw neat and clean diagrams
4. Assume suitable data if required.

Q. 1. A. Give reasons for the following 5

I. FET is called as a square law device

II. Barkhausens criteria should be satisfied to get oscillations

B. With neat diagram explain any one application of Zero-Crossing Detector 5

C. With neat circuit diagram explain the use of PLL as a phase shifter 5

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(b) V_{GS} = −1.5 V.

(c) V_{GS} = −2.5 V. 5

TURN OVER

MD-Con. 8333 -15.