S.E Computer Sem(3)(CBGS) 12/12/14.
Discrete Structures

QP Code :14675

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

N.B : (1) Question **No. 1** is **compulsory.**
(2) Solve any **three** questions out of remaining **three** questions.
(3) All questions carry **equal** marks as indicated by **figures** to the **right.**
(4) Assume appropriate data whenever required. State all assumptions clearly.

1. (a) Prove by mathematical induction x^n-y^n is divisible by x-y. **5**
(b) How many vertices are necessary to construct a graph with exactly 6 edges in which each vertex is of degree 2 . **5**
(c) Show that a relation is reflexive and circular if and only if it is an equivalence relation. **5**
(d) Prove that the set G = {1, 2, 3, 4, 5, 6} is an abelian group under multiplication modulo 7. **5**

2. (a) Is it possible to draw a tree with five vertices having degrees 1, 1, 2, 2, 4? **4**
(b) Find how many integers between 1 and 60 are **8**
(i) not divisible by 2 nor by 3 and nor by 5. 44
(ii) Divisible by 2 but not by 3 and nor by 5.
(c) Solve the recurrence relation $a_{r+2}-a_{r+1}-6a_r = 4$ **8**

3. (a) Show that $A \cap (B \oplus C) = (A \cap B) \oplus (A \cap C)$ **4**
(b) State and explain Pigeonhole principle, extended Pigeonhole principle. How many numbers must be selected from the set {1, 2, 3, 4, 5, 6} to guarantee that at least one pair of these numbers add up to 7? **8**
(c) Let R be a relation on set A = {1, 2, 3, 4}, given as **8**
R = { (1, 1) ,(1, 4) , (2, 2) , (2, 3) , (3, 2) , (3, 3) , (4, 1) , (4, 4) }.
Find transitive closure using Warshall's Algorithm.

4. (a) Find the generating function for the following sequence **4**
(i) 1, 2, 3, 4, 5, 6.....
(ii) 3, 3, 3, 3, 3.....
(b) Show that the (2, 5) encoding function $e:B^2 \rightarrow B^5$ defined by **8**
e(00) = 00000 e(01) = 01110
e(10) = 10101 e(11) = 11011 is a group code.
How many errors will it detect and correct.
(c) Draw Hasse Diagram of D_{42}. Find the complement of each element in D_{42}. **8**

5. (a) Define Distributive Lattice along with one appropriate example. **4**

(b) Let the functions f, g, and h defined as follows : **8**

$f: R \to R$, $f(x) = 2x+3$

$g: R \to R$, $g(x) = 3x+4$

$h: R \to R$, $h(x) = 4x$

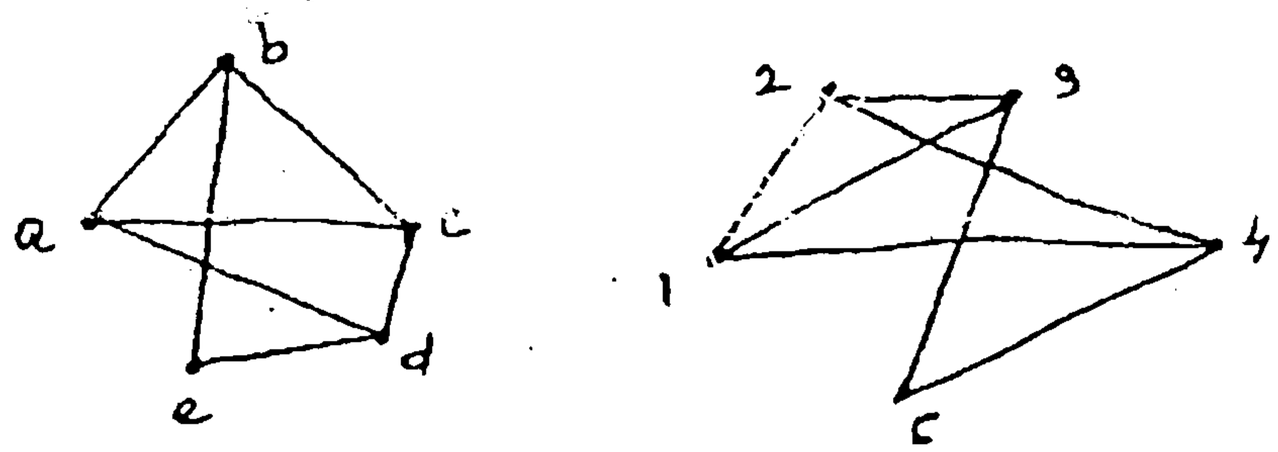
Find gof, fog, foh, hof, gofoh

(c) let $H = \begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$ **8**

Be a parity check matrix. Determine the group code $e_{H:}$ $B^3 \to B^6$

6. (a) Determine if $[(p \Rightarrow q) \wedge \neg q] \Rightarrow \neg p$ is a tautology. **4**

(b) Define isomorphic graphs. Show that following graphs are isomorphic. **8**



(c) R be a relation on set of integers Z defined by **8**

$R=\{(x, y) \mid x-y$ is divisible by $3\}$

Show that R is an equivalence relation and describe the equivalence classes.

S-E. Sem III (Comps) (CBGS)

8/12/14

DLDA

QP Code : 14644

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

N.B. (1) Question No. **1** is **compulsory**.
(2) Assume suitable **data** if **necessary**.
(3) Attempts any **three** questions from **remaining** questions.

1. (a) Represent $(29)_{10}$ into Excess-3 code and Gray code. **2**
(b) Convert the following hex no. $(67{\cdot}4A)_{16}$ into equivalent Octal no. **2**
(c) Convert decimal $(215{\cdot}32)$ into base '7'. **4**
(d) Convert $(670{\cdot}17)_8$ into binary and hex. **4**
(e) Add $(57)_{10}$ and $(26)_{10}$ in BCD. **2**
(f) Explain uses of Gray code. **4**
(g) Add $(DDCC)_{16}$ and $(BBAA)_{16}$. **2**

2. (a) (i) State the boolean algebra laws used in k-map simplification. **5**
(ii) Simplify $Y = ABC\left(\overline{CD}\right) + \overline{B}CD + \left(\overline{A}\,\overline{C}\right)\left(B + D\right)$. **5**
(b) A misquided mathematician would like to subtract term $A\overline{C}$ from both sides of equality. **10**

$$BC + ABD + A\overline{C} = BC + A\overline{C}$$

Would they still be equal if he did so. Justify and simplify the expression.

$$F = \left(x + \overline{z}\right)\left(\overline{Z + WY}\right) + \left(VZ + W\overline{x}\right)\left(\overline{Y + Z}\right)$$

3. (a) Simplify using boolean theorems and implement using AOI gate only.
(i) $\overline{\overline{AB + \overline{A}\,\overline{B}} + \overline{\left(A + B\right)\cdot\left(\overline{A} + B\right)}}$ **5**
(ii) Implement the following expression using NAND-NAND logic $y = \Sigma m(0, 1, 5)$ **5**
(b) Simplify using k-map obtain SOP equation and realize using NAND gate. **10**
$f(A, B, C, D) = \Pi M(1, 2, 3, 8, 9, 10, 11, 14) + d(7, 15)$.

4. (a) Implement the following expression using 8 : 1 mux **4**
$f(A, B, C, D) = \Sigma m(0, 1, 3, 5, 7, 10, 11, 13, 14, 15)$.
(b) Explain with example 4 bit BCD adder using IC-7483. **8**
(c) Compare the performance of TTL, CMOS and ECL logic. **8**

5. (a) What is shift register ? Explain 4 bit bi-directional shift register. **10**
(b) Convert JK FF to SR and DFF. **10**

6. Write short note on (any **three**) :— **20**
(a) State table
(b) VHDL
(c) Difference between CPLD and FPGA
(d) Decade counters.

Sem III ... Data Structure

QP Code :14605

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

N.B : (1) Question no.1 is **compulsory**.
(2) Attempt any **three** questions out of the remaining **five** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Make suitable assumptions wherever necessary with justification.

1. (a) What is recursion? Write a 'C' program to calculate sum of 'n' natural numbers using recursion. **5**
(b) What is a Mutiway Search Tree. Explain with an example. **5**
(c) Give ADT for the queue data structure. Discuss in brief any two applications of the queue data structure. **5**
(d) Compare and contrast Quicksort and Radix sort on basis of their advantages and disadvantages. **5**

2. (a) Write a 'C' program to implement a priority queue. **8**
(b) What are different types of files? Explain various file handling operations in 'C'. **7**
(c) Explain with examples different techniques to represent the graph data structure on a computer. Give 'C' language representations for the same. **5**

3. (a) Consider the following list of numbers :— **10**
67, 12, 89, 26, 38, 45, 22, 79, 53, 9, 61.
Sort these numbers using Heap Sort.
(b) Write a 'C' program to implement a singly Linked List which supports the following operations : **10**
(i) Insert a node in the beginning
(ii) Insert a node in the end
(iii) Insert a node after a specific node
(iv) Deleting a specific node
(v) Displaying the list.

4. (a) Write a 'C' program to convert a polish notation to reverse polish notation. **10**
(b) Consider the following list of numbers : **10**
18, 25, 16, 36, 08, 29, 45, 12, 32, 19.
Create a binary search tree using these numbers and display them in a nondecreasing order. Write a 'C' program for the same.

5. (a) Discuss how memory allocation for a sparse matrix can be optimized using a linked list. Write a C-program for the same. **15**
(b) Write a function for DFS traversal of graph. Explain its working with an example. **5**

6. (a) Insert the following elements in AVL tree : **10**
44, 17, 32, 78, 50, 88, 48, 62, 54.
Explain the different rotations that will be used.
(b) Write a 'C' program to search a list using Indexed Sequential Search. What are the advantages of using Indexed Sequential Search over Sequential Search? **10**

S.E. Computer & I.T.
CBGS - Sem(3).
App. Maths-3

20/11/14.

QP Code : 14544

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

N.B. (1) Question no. **1** is **compulsory.**
(2) Attempt any **three** from the remaining.
(3) **Figures** to the **right** indicate **full** marks.

1. (a) Find the Laplace Transform of sint cos2t cosht. **5**
(b) Find the Fourier series expansion of $f(x) = x^2 \ (-\pi, \pi)$ **5**
(c) Find the z-transform of $\left(\frac{1}{3}\right)^{|k|}$ **5**
(d) Find the directional derivative of $4xz^2+x^2yz$ at (1, -2, -1) in the direction of $2\bar{i} - \bar{j} - 2\bar{k}$ **5**

2. (a) Find an analytic function f(z) whose real part is $e^x(x\cos y - y\sin y)$ **6**
(b) Find inverse Laplace Transform by using convolution theorem $\frac{1}{(s-3)(s+4)^2}$ **6**
(c) Prove that $\bar{F}=(6xy^2-2z^3)\bar{i}+(6x^2y+2yz)\bar{j}+(y^2-6z^2x)\bar{k}$ is a conservative field. Find the scalar potential Φ such that $\nabla\phi = \bar{F}$. Hence find the workdone by $\bar{F}$ in displacing a particle from A(1,0,2) to B(0,1,1) along AB. **8**

3. (a) Find the inverse z-transform of $F(z) = \frac{z^3}{(z-3)(z-2)^2}$ **6**
(i) $2 < |z| < 3$ (ii) $|z| > 3$
(b) Find the image of the real axis under the transformation $w=\frac{2}{z+i}$ **6**
(c) Obtain the Fourier series expansion of **8**
$f(x) = \pi x \ ; \ 0 \le x \le 1$
$= \pi(2-x); \ 1 \le x \le 2$
Here deduce That $\frac{1}{1^2}+\frac{1}{3^2}+\ldots = \frac{\pi^2}{8}$

4. (a) Find the Laplace Transform of **6**
$f(t) = E; \ 0 \le t \le p/2$
$= -E; \ p/2 \le t \le p,$ $f(t+p)=f(t)$

[TURN OVER

(b) Using Grecen's theorem evaluate $\int_c \frac{1}{y}dx+\frac{1}{x}dy$ where c is the boundary of the region bounded by x=1, x=4, y=1, y=$\sqrt{x}$ 6

(c) Find the Fourier integral for f(x)= $1-x^2$, $0\leq x\leq 1$
= 0 x>1

Heance evaluate $\int_0^\infty \frac{\lambda\cos\lambda-\sin\lambda}{\lambda^3}\cos\left(\frac{\lambda}{2}\right)d\lambda$ 8

5. (a) If $\bar{F}= x^2\bar{i}+(x-y)\bar{j}+(y+z)\bar{k}$ moves a particle from A(1, 0, 1) to B(2, 1, 2) along line AB. Find the workdone. 6

(b) Find the complex form of fourier series f(x) =sinhax $(-\ell, \ell)$ 6

(c) Solve the differential equation using Laplace Transform. 8
$(D^2+2D+5)\ y=e^{-t}\sin t\ y(0)= 0\ \ y'(0)= 1$

6. (a) If $\int_0^\infty e^{-2t}\ sn(t+\alpha)\cos(t-\alpha)\ dt=\frac{3}{8}$ find the value of α. 6

(b) Evaluate $\iint_s (y^2z^2\bar{i}+z^2x^2\bar{j}+z^2y^2\bar{k})\ .\ \bar{n}\,ds$ where s is the hemisphere $x^2+y^2+z^2=1$ above xy- plane and bounded by this plane. 6

(c) Find Half range sine series for f(x)= $\ell x-x^2$ $(0, \ell)$ 8

Hence prove that $\frac{1}{1^6}+\frac{1}{3^6}+....=\frac{\pi^6}{960}$

S.E (Computer) IN CBSGS
Electronics Ckts & Communication
(EXTC)

QP Code : 14577

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

N.B : (1) Question no. **one** is **compulsory**.
(2) Solve any **three** out of remaining questions.
(3) Assume suitable data if required.

1. Solve the following :— **20**
   (a) Mention five important specifications of ADC/DAC that are looked at while selecting them for any application.
   (b) Discuss the factors that influence modulation index of an FM wave.
   (c) Draw FET based Hartley and Colpitt Oscillator. What is the frequency of oscillation if
      (i) L1 = 10 mH, L2 = 10 mH and C=0.1μF for Hartley tank circuit
      (ii) L=10 mH, C1 = 0.1μF and C2 = 0.1 μF for Colpitt tank circuit.
   (d) A public address system is connected to a microphone that has a maximum output voltage of 10mV. The microphone is connected to a 10 watt audio amplifier system that is driving an 8 Ohm speaker. The voltage amplifier is a noninverting op-amp circuit. Calculate the maximum voltage gain for the voltage amplifier stage and determine the resistor values to obtain the desired gain. Assume the power amplifier stage has a voltage gain of 1.

2. (a) With proper circuit diagrams and transfer characteristics indicating Q-points do comparison of JFET bias circuits in detail. **10**
   (b) Find R1 and R2 in the lossy integrator so that the peak gain is 20 dB and the gain is 3 dB down from its peak when ω = 10,000 rad/s. Use capacitance of 0.01μF. **10**

3. (a) Sketch a block representation for an n-channel JFET, showing bias voltages, depletion regions, and current directions. Label the device terminals and explain its operation. Explain the effect of increasing levels of negative gate-source voltage. Also sketch a typical drain characteristics for $V_{GS}=0$ for an n-channel JFET. Explain the shape of the characteristic, identify the regions, and indicate the important current and voltage levels. **10**
   (b) Draw the spectrum of an amplitude modulated wave and explain its components. **5**
   (c) Draw and explain opamp non inverting comparator. Draw input and output waveforms for Vref positive and also for Vref negative. **5**

4. (a) Explain the working of a superheterodyne receiver with the help of a neat block diagram. Show the waveforms at the output of each block. **10**
   (b) What is DSBSC wave? Explain its generation using balanced modulator. **10**

5.	(a)	Draw the PAM, PWM and PPM waveforms in time domain assuming a sinusoidal modulating signal. Explain them in brief.	10
	(b)	The maximum deviation allowed in a FM broadcast system is 75kHz. If the modulating signal is a single tone sinusoidal of frequency 15kHz, find the bandwidth of the FM signal. How does the bandwidth change if the modulating frequency is doubled?	5
	(c)	How is adaptive delta modulation superior to delta modulation?	5
6.	(a)	What do you understand by signal multiplexing? Explain TDM and FDM with suitable examples.	10
	(b)	With neat circuit diagram explain the use of PLL as phase shifter.	5
	(c)	Give advantages and disadvantages of SSB over full carrier DSB amplitude modulated wave.	5

S.E. Computer/IT Semiv CBSGS

COPM

QP Code :14704

(3 Hours) [Total Marks :80

N.B. : (1) Question No.**1** is **compulsory**.
(2) Attempt any **three** from remaining.

1. (a) Write a program that queries a user for the no.: of rows and columns representing students and their marks. **10**
Reads data row by row and displays the data in tabular form along with the row totals, column totals and grand total
Hint : For the data 1, 3, 6, 7, 9, 8 the output is

1	3	6	|	10
7	9	8	|	24
8	12	14	|	34

(b) Explain System.arraycopy ( ) **5**
(c) Explain multiple inheritance in java with suitable example. **5**

2. (a) Identify classes and their attributes and draw the relationships that are described by the following business rules. Include the multiplicities for each relationship. **12**
(i) A patient must be assigned to only one doctor and a doctor can have one or many patients.
(ii) An employee has one phone extension and unique phone extension is assigned to an employee.
(iii) A movie theatre shows atleast one movie and a movie can be shown at upto 4 other movie theatres around town.
(iv) A movie either has one star, 2 co-stars or more than 10 people starring together. A star must be in atleast one movie.

(b) Explain coupling and cohesion with suitable example. **8**

3. (a) Each year, sleepy Hollow Elementary school holds a "Principal for a Day" lottery. **10**
A student can participate by entering his/her name and ID into a pool of candidates. The winner is selected randomly from all entries. Each student is allowed one entry. Implement a student class that encapsulates a student. Implement StudentLottery class with methods addStudents () and pickwinner () and main ()
Hint : Use Random class to pick winner.

(b) With suitable example ,explain creation and use of user defined packages. **10**

4.(a) Write detailed note on following exception handling terms. **10**

(i) try-catch (ii) finally
(iii) Catch multiple exception
(iv) Throwing exception.

(b) Write a program that computes the sum of a list of integers that is supplied by a user. The end of data signalled by the value - 999. This value is used only as a flag and not used in sum. **10**

5. (a) Create Rectangle and Cube class that encapsulates the properties of a rectangle and cube i.e. Rectangle has default and parameterised constructor and area () method. Cube has default and parameterised constructor and volume () method. They share no ancestor other than Object. **15**
Implement a class Size with size() method. This method accepts a single reference argument z. If z refers to a Rectangle then size (z) returns its area and if z is a reference to a Cube, then size (z) returns its volume. If z refers to an object of any other class, then size (z) returns - 1. Use main () method in Size class to call size (..) method.

(b) Differentiate between Interface and abstract class. **5**

6. Write short notes on any **four** :– **20**

(a) JVM (b) Package
(c) Polymorphism (d) Wrapper class
(e) ArrayList and LinkedList
(f) Vector.
