SE-III / Analog & Digital Circuits / I.T.

08-12-14

(3 Hours) [Total Marks :80]

N.B. : (1) Question no. 1 is **compulsory**.
(2) Attempt **any three** questions from remaining **five** questions.
(3) Assume suitable data if required

1. Solve any **five**   20
   (a) Convert $(41.62)_8$ to decimal, binary and hexadecimal
   (b) Compare BJT and FET.
   (c) Why Zener diode is used as a regulator?
   (d) Define (i) Slew rate (ii) CMRR. What are the typical values of slew rate and CMRR for Op-amp IC- 741?
   (e) Convert JK-flip flop to D flip flop
   (f) What do you mean by Universal gate? Implement Ex-OR gate using NAND gate.

2. (a) What is the need of blasing? Explain Voltage divider bias and locate Q point.   10
   (b) Design half adder using VHDL.   5
   (c) Simplify $AB + B + \overline{AC} + A\overline{B}C\,(AB + C)$ 5
   $$AB + B + \overline{AC} + A\overline{B}C\,(AB + C)$$

3. (a) Minimize the following Boolean function using K-map   10
   $$F(A,B,C,D) = \sum m(0,3,7,11,15) + d\,(1,2,5)$$
   (b) Explain Differentiator using Op-amp   5
   (c) Explain the working of Liquid Crystal display.   5

4. (a) Design and implement 4 bit binary to gray code converter.   10
   (b) Implement $F(A,B,C,D) = \sum m(1,2,5,11,14) + d\,(0,3)$ using 8:1 multiplexer.   5
   (c) Explain inverting amplifier using Op-amp. Derive expression for output voltage.   5

5. (a) Explain the working of astable multivibrator using IC-555. Design astable multivibrator for output frequency 5KHz and duty cycle 30%.   10
   (b) Differentiate between combinational and sequential logic circuits.   5
   (c) Design mod-3 up counter using JK flip-flop   5

6. Write notes on **Any four** :-   20
   (a) Instrumentation amplifier using 3-OP-Amps.
   (b) Shift registers.
   (c) Race around condition.
   (d) Current mirror circuit.
   (e) Multiplexers and De multiplexers.

App. Maths - III

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 $\left(\dfrac{1}{3}\right)^{|k|}$ 5

(d) Find the directional derivative of $4xz^2+x^2yz$ at $(1, -2, -1)$ in the direction 5
of $2\bar{i}-\bar{j}-2\bar{k}$

2. (a) Find an analytic function $f(z)$ whose real part is e^x (xcosy- ysiny) 6
(b) Find inverse Laplace Transform by using convolution 6

theorem $\dfrac{1}{(s-3)(s+4)^2}$

(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. 8
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.

3. (a) Find the inverse z-transform of $F(z) = \dfrac{z^3}{(z-3)(z-2)^2}$ 6

(i) $2 < |z| < 3$ (ii) $|z| > 3$

(b) Find the image of the real axis under the transformation $w=\dfrac{2}{z+i}$ 6

(c) Obtain the Fourier series expansion of 8
$f(x) = \pi x \ ; \ 0 \le x \le 1$
$= \pi(2\text{-}x); \ 1 \le x \le 2$

Here deduce That $\dfrac{1}{1^2}+\dfrac{1}{3^2}+.....= \dfrac{\pi^2}{8}$

4. (a) Find the Laplace Transform of 6

$f(t) = E; \ 0 \le t \le \dfrac{P}{2}$
$= -E; \ \dfrac{P}{2} \le t \le p, \quad f(t+p)=f(t)$

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(b) Using Grecen's theorem evaluate $\int_c \frac{1}{y}dx + \frac{1}{x}dy$ where c is the boundary   6

of the region bounded by x=1, x=4, y=1, y=$\sqrt{x}$

(c) Find the Fourier integral for f(x)= 1-x², 0≤x≤1   8

                 = 0   x>1

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

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   6
     B(2, 1, 2) along line AB. Find the workdone.

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

(c) Solve the differential equation using Laplace Transform.   8
     (D²+2D+5) y=e⁻ᵗ sint y(0)= 0 y'(0)= 1

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

(b) Evaluate $\iint_s (y^2z^2\bar{i}+z^2x^2\bar{j}+z^2y^2\bar{k})\cdot\bar{n}\,ds$ where s is the hemisphere   6

     x²+y²+z²=1 above xy- plane and bounded by this plane.

(c) Find Half range sine series for f(x)= ℓx-x² (0,ℓ)   8

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

QP Code :14690

(3 Hours) [Total Marks : 80

N. B. : (1) Question No. 1 is **compulsory**.
(2) Solve any **three** questions out of remaining **five**.

1. (a) Define the following terms :–   10
      (i) Foreign key
      (ii) Derived attribute
      (iii) Deadlock
      (iv) Schedule
      (v) Data Independence

    (b) Suppose that we decompose the schema   5
      $R = \{A, B, C, D, E\}$ into
      $R1 = \{A, B, C\}$ and
      $R2 = \{A, D, E\}$
      Show that this decomposition is lossless join decomposition if the following set
      of functional dependencies hold
      $A \rightarrow BC$ $CD \rightarrow E$
      $B \rightarrow D$ $E \rightarrow A$

    (c) Explain Generalization and Specialization.   5

2. (a) What are triggers? Explain with example.   10
    (b) Explain advantages of DBMS over file system.   10

3. (a) Draw E-R diagram for university database consisting of four entities: Student,   10
department, class, faculty. Student has a unique id, the student can enroll for
multiple classes and has at most one major. Faculty must belong to department
and faculty can teach multiple classes. Each class is taught by only one faculty.
Every student will get grade for the class he/she has enrolled.

    (b) Explain serializability with example.   10

4. (a) Consider Insurance Database given below and answer the following queries in   10
SQL.
Person (driver_id, name, address)
Car (license, model, year)
Accident (report_no, adate, location)
Owns (driver_id, license)
Participated (driver_id, license, report_no, damage_amount)
      (1) Find total number of people who owned cars that are involved in accidents
          in 2004.

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      (2) Find the number of accidents in which car belonging to 'John Smith' were involved.

      (3) Add new accident to Database.

      (4) Delete 'Santro' belonging to 'John Smith'.

  (b) List the ACID properties. Explain usefulness of each.   10

5. (a) Consider the following relation   10
CAR-SALE (Car#, Date-sold, Salesman#, commission%, Discount-amt)
Assume that {Car#, Salesman#} is the primary key. Additional dependencies are
Date-sold $\rightarrow$ Discount-amt
Salesman# $\rightarrow$ commission%
Based on the given primary key, is this relation in 1NF, 2NF or 3NF? Why or why not? How would you successively normalize it completely?

  (b) Explain concurrency control in database system with the help of only two protocols.   10

6. (a) Explain any four relational algebra operations with proper examples.   10
  (b) Draw a query tree for the following SQL query   10
Select P. Pnumber, P.Dnum, E.Lname, E.Address, E.Bdate from project as P, Department as D, Employee as E where P.Dnum = D.Dnumber
and D.Mgr-ssn = E.ssn
and P. Plocation = 'Mumbai'

SE / III / I.T. / Data Structure & Algo. Anal. / 02/12/14

(3 Hours) [Total Marks : 80

N.B. : (1) Questioin No. **1** is **compulsory**.
    (2) Attempt any **three** out of **remaining**.
    (3) **Figures** to **right** indicate **full** marks.

1. (a) Explain big O notation.   3
   (b) Consider the following recursive function that takes two arguments   3

```
int foo( int n. int r)
{
        if (n > 0)
        return ((n% r) + foo( n / r, r));
else
        return 0;
}
```

What is the return value of the function foo when it is called as foo (65, 2) ?
   (c) What is a queue ? Specify ADT for it.   3
   (d) What is linked list ? State the different types of linked list.   3
   (e) Write down properties of Red-Black tree.   3
   (f) Define a graph. Which are the methods to represent a graph ?   3
   (g) Define minimum spanning tree. State the techniques to compute minimum   2
spaninng tree.

2. (a) Explain Quick sort using an example.   10
Write algorithm for it and comment on its complexity.
   (b) Define double ended queue. Specify ADT for it. Implement any 2 operations   10
of it.

3. (a) Construct the binary tree for the inorder and postorder traversal sequence   10
given below :—
       Inorder   "INFORMATION"
       Postorder "INOFMAINOTR"
Write a function to traverse a tree in postOrder.
   (b) Convert following infix expression into prefix and postfix format.   10
       (a*b - (c + d / e ^ f) - g) * h
Write an algorithm Conversion( ) to convert infix expression into postfix
expression.

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4. (a) Write a program for implement array based Queue? List its applications.   1 0
   (b) Sort the following data in descending order using Heap Sort.   1 0
       20, 14, 50, 3, 5, 7, 11, 8, 12, 15
       Show all the steps.
       Write an algorithm for heap sort.

5. (a) What is an AVL tree ? Construct AVL tree for following data.[Mention the   1 0
       type of rotation for each case.]
       1, 2, 3, 4, 8, 7, 6, 5, 11, 10, 12.
   (b) Write functions to implement insert( ) and traverse( ) of singly inked list. 1 0

6. (a) Draw the minimum cost spanning tree using Kruskal's algorithm. Also find its 1 0
       cost with all intermediate steps.
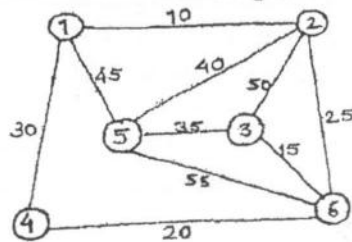
   (b) Explain Binary search tree with an example.   5
   (c) Write an algorithm for DFS traversal.   5

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(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 10
students and their marks.
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 12
by the following business rules. Include the multiplicities for each relationship.
(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.

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(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   10
user. The end of data signalled by the value - 999. This value is used only as a
flag and not used in sum.

5. (a) Create Rectangle and Cube class that encapsulates the properties of a rectangle   15
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.
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.

Course   :   S.E (COMPUTER & INFORMATION
                     TECHNOLOGY) (SEM III) (CBSGS)(PROGG. C.
                     616 To 630)

Q.P Code   :   14704

Correction   :

READ:

Ques. No. 1 (c) is to be read as it is.

Ques. No. 4 (b) value is to be read as "**-999**" **(negative).**

Ques. No. 5 (a) returns – 1 to be read as "**-1**" **(negative).**

Query Update time : 18/12/2014 03:20 PM

QP Code : **14583**

(3 Hours) [Total Marks : 80

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

1. Solve any four: 20
    (i) Explain types of communication channels?
    (ii) Compare ASK, PSK, FSK modulation techniques?
    (iii) Explain- Fidelity
    (iv) What is quantization?
    (v) What is Image Frequency and its rejection?

2. (a) Explain the operating principal, working of Differentially Encoded Phase   10
       Shift Keying modulator and demodulator?
   (b) A sinusoidal carrier has an amplitude of 10v and a frequency of 100KHZ. It   10
       is amplitude modulated by a sinusoidal voltage of amplitude 3v and frequency
       500HZ. Modulated voltage is developed across 75 Ω resistance:
        (i) Write the equation for modulated wave.
        (ii) Determine the modulation index.
        (iii) Draw spectrum of modulated wave.
        (iv) Calculate the total average power.
        (v) Calculate the power carried by sidebands.

3. (a) Explain the block diagram of analog and digital communication system? If   10
       information rate is maximum which type of modulation technique can be
       used?
   (b) What is probability of error and Bandwidth requirement for BPSK?   10

4. (a) Explain sampling theorm for bandpass signals with proof. And also explain   10
       anti-alising filter?
   (b) Explain Armstrong method for FM generation?   10

5. (a) Explain PPM generation and degeneration method?   8
   (b) Write fourier Transform of Unit step, Delta and gate function?   8
   (c) What is eye pattern?   4

6. (a) Write short notes on (any four)   20
        (i) Multiplexing Techniques
        (ii) Noise Figure and Noise Factor
        (iii) Pre-emphasis and De-emphasis
        (iv) Line codes
        (v) M-ray Phase Shift Keying

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