wa-Con-2012
Con. 7330–12.

KR–3113

(3 Hours) [Total Marks : 100

N.B. (1) Question No. 1 is compulsory.
(2) Attempt any four out of remaining six questions.
(3) Make suitable assumptions if required and justify the same.
(4) A figure to right indicates the full marks.

1. (a) Find $L(te^{3t} \sin t)$ 05

(b) Use the adjoint method to find the inverse of 05

$$\begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \\ 3 & 1 & 2 \end{bmatrix}$$

(c) Find p if $f(z) = r^2 \cos 2\theta + ir^2 \sin p\theta$ is analytic. 05

(d) Find the Fourier Series for $f(x) = x^2$ in $(-1,1)$ 05

2. (a) Show that $u = \cos x \cosh y$ is harmonic function. Find its harmonic
conjugate and corresponding analytic function. 08

(b) Show that the set of functions $\cos x$, $\cos 2x$, $\cos 3x$, ... from a
orthonormal set in the interval $(-\pi, \pi)$. 06

(c) For matrix A verify that $A(adj.A) = |A|I$

$$A = \begin{bmatrix} 2 & 1 & 3 \\ 3 & 1 & 2 \\ 1 & 2 & 3 \end{bmatrix}$$ 06

3. (a) Find the Laplace transform of each of the following:-

(i) $\dfrac{e^{-t} \sin at}{t}$ (ii) $te^{3t} \cos t$ 06

(b) Find half range sine series for the function

$$f(x) = x, \qquad 0 \le x \le \frac{\pi}{2}$$

$$= \pi - x, \qquad \frac{\pi}{2} \le x \le \pi$$ 06

(c) Find non-singular matrices $P \& Q$ such that PAQ is normal form.
Hence find its rank where A is given by

$$A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$$ 08

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ws-Con-2012

4. (a) Solve the system of equations $x - y + 2z = 9$, $2x - 5y + 3z = 18$, $6x + 7y + 10z = 35$. **06**

    (b) Find the inverse Laplace transform of the following

    (i) $\dfrac{e^{4-3s}}{(s+4)^{5/2}}$

    (ii) $\dfrac{8e^{-3s}}{s^2 + 4}$ **06**

    (c) Expand the function $f(x)$ with period a into a Fourier Series.
    $$f(x) = x^2, \qquad 0 \le x \le a$$ **08**

5. (a) Using Convolution theorem, Find the inverse Laplace transform of the following

    $$\frac{s^2 + 2s + 3}{(s^2 + 2s + 5)(s^2 + 2s + 2)}$$ **06**

    (b) Find the analytic function and its imaginary part if real part is

    $$\frac{\sin 2x}{\cosh 2y - \cos 2x}$$ **06**

    (c) Find the Fourier series for the function
    $$f(x) = x, \qquad 0 \le x \le \pi$$
    $$= 2\pi - x, \qquad \pi \le x \le 2\pi$$ **08**

6. (a) Using Laplace transformation, solve the following equation.
    $$(D^2 - 3D + 2)y = 4e^{2t}, \text{ with } y(0) = -3 \, \& \, y'(0) = 5$$ **06**

    (b) Find the Fourier series for the function $f(x) = \pi x$, $0 < x < 1$
    $$= 0, \, 1 < x < 2$$ **06**

    (c) Determine l, m, n and find A^{-1} if $A = \begin{bmatrix} 0 & 2m & n \\ l & m & -n \\ l & -m & n \end{bmatrix}$ is orthogonal **08**

7. (a) Evaluate the following integral by using Laplace transform
    $$\int_0^\infty e^{-2t} \sin^2 2t \, dt$$ **06**

    (b) If $f(a) = \int \dfrac{4z^2 + z + 5}{z - a} dz$ where C is $|z| = 2$, find the values of $f(1), f(i), f'(-1) \, \& \, f''(-i)$ **08**

    (c) Reduce the following matrix to normal form and find its rank.
    $$A = \begin{bmatrix} 1 & -1 & 3 & 6 \\ 1 & 3 & -3 & -4 \\ 5 & 3 & 3 & 11 \end{bmatrix}$$ **06**

72 : 2nd half-12-(e) JP

Con. 7345-12.   **KR-3221**

(3 Hours)   [Total Marks : 100

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

1. (a) State and explain Barkhusen's Criterion for oscillator.   6
   (b) Obtain the expression for the collector current of a x'ster in CE configuration.   6
   (c) Draw the Ckt diagram and explain the operation of Dual input unbalanced output   8
      differential amplifier.

2. (a) With the help of Block diagram explain operation of practical inverting amplifier.   6
   (b) Draw the Ckt diagram and explain operation of wienbridge oscillator.   6
   (c) Explain different external compensation tech.   8

3. (a) Derive the frequency response of a practical differentiator and explain it's working.   10
   (b) Draw the typical connection diagram of VCO using IC 566. State the expression   10
      for the output frequency how the output frequency can be changed.

4. (a) A 6 bit DAC has an input 100101 and 10V reference voltage find :—   10
      (i) Output voltage
      (ii) Conversion resolution.
   (b) Design a regulator using IC - 723 to meet the following specification   10
      $V_0 = 5V$. $I_0 = 100$ mA, $V_{in} = 15 \pm 20\%$
      $I_{SC} = 150$ mA, $V_{sense} = 0.7$ V.

5. (a) Draw the Ckt diagram and explain the operation of monostable multivibrator.   10
   (b) Derive the expression for stability factor 'S' for different BJT Biasing Ckt.   10

6. (a) What is a notch filter ? Explain it's operation with the help of neat Ckt diagram.   10
   (b) Draw the Ckt diagram and explain the operation of triangular wave generator   10
      using OP-AMP.

7. (a) Write program for SPICE simulation of non-inverting amplifier.   10
   (b) Explain various circuits used to provide constant current bias in a differential   10
      amplifier.

(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) Write an algorithm for Binary Search Method with example.   5
  (b) Explain Asympotic notations and write the properties of asympotic notations.   5
  (c) What are linear and non-linear data structures ?   5
  (d) What is a Vector ? Explain any four functions.   5

2. (a) Define Binary Tree. Write on algorithm to implement different tree traversal   10
    techniques.
  (b) Write a program to create singly linked list and display the list.   10

3. (a) Write an algorithm for merge sort and comment on its complexity.   10
  (b) Hash the following in a table of size 11. Use any two collision resolution technique.   10
      99   67   41   0   17   2   98   20   94   27.

4. (a) Write a program to implement queue using array.   10
  (b) Explain Huffman Algorithm. Construct Huffman tree for "MAHARASHTRA" with   10
    its optimal code.

5. (a) Write an algorithm to traverse a graph using –   10
      (i) Breadth first search
      (ii) Depth first search.
  (b) Write an ADT for stack and implement it using array. The ADT should support   10
    following operations :–
      (i) Create
      (ii) Push
      (iii) POP
      (iv) Display

6. (a) Write a program to implement Quick sort and show the steps to sort the following   10
    elements by Quick sort method :–
      19   27   5   9   86   45
  (b) What is Doubly Linked List ? Write an algorithm to implement following operations   10
    with DLL :–
      (i) Insertion (All Cases)
      (ii) Traverse (Forward and Backward)

7. Write short note on (any **four**) :–   20
  (a) Pattern Matching
  (b) Expression Tree
  (c) Red and Black Trees
  (d) Shortest Path Algorithm
  (e) Priority and Circular Queue
  (f) Selection Sort.

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KR–3452

(3 Hours) [Total Marks : 100

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

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

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

(4) Assume **suitable** data whenever **necessary**.

1. (a) Explain, NAND gate as a Universal Logic gate. 4

(b) Convert the following binary numbers to Decimal, Hexadecimal and octal form. 6

(i) $(101101\cdot1101)_2$

(ii) $(11011011\cdot100101)_2$

(c) Encode the binary word 1011 into seven bit even parity Hamming code. 4

(d) State and explain De Morgan's theorms. 6

2. (a) Reduce the following function using :

(i) Karnaugh map technique and implement using basis gates 6

$$f(A,B,C,D) = \overline{A}\,\overline{B}D + AB\overline{C}\,\overline{D} + \overline{A}BD + ABC\overline{D}$$

(ii) Minimize the expression using K Map technique. 4

$$Y = A\overline{B}C + \overline{A}\overline{B}C + \overline{A}BC + A\overline{B}\overline{C} + \overline{A}\overline{B}\overline{C}$$

(b) Simplify the following Boolean function by using a Quine-McCluskey method. 10

$$F(A,B,C,D) = \sum m(0, 2, 3, 6, 7, 8, 10, 12, 13)$$

3. (a) Implement the following Boolean function using 8 : 1 multiplexer 8

$$f(A,B,C,D) = \overline{A}\,B\,\overline{D} + A\,C\,D + \overline{B}\,C\,D + \overline{A}\,\overline{C}\,D$$

(b) Design 2-bit comparator using gates. 12

4. (a) Convert : 10

(i) SR flip flop to D flip flop

(ii) T flip flop to D flip flop

(b) Explain master slave JK flip flop in detail. How race around condition is avoided. 10

5. (a) Explain 4 bit bidirectional shift register. What are uses of register ? 10

(b) Design Binary to Grey code converter. 10

6. (a) Explain parity generator and checker . 10

(b) Design 3 bit synchronous counter using JK flip flop. 10

7. Write notes on any **two** :– 20

(a) CAD tools

(b) VHDL features

(c) PAL and PLA

(d) Mealy and Moore machines.

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Con. 10649-12.

KR-3551

(3 Hours)

[Total Marks : 100

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

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

1. (a) What is the purpose of a database system ? 20
   (b) Give difference between :—
       (i) Listbox and combobox
       (ii) Radio button and check button.
   (c) Explain views in SQL.
   (d) What do you mean by object linking and embedding ?

2. (a) Explain the terms :— 10
       (i) Entity
       (ii) Cardinality
       (iii) Weak relationship
       (iv) Composite attribute
       (v) Recursive relationship.
   (b) Given the following business rules, create the appropriate ER diagram : 10
       (i) A company operates many departments
       (ii) Each department employs one or more employees.
       (iii) Each of the employees might or might not have one or more dependents.
       (iv) Each employee might or might not have an employment history.

3. (a) Discuss DDL and DML with examples. 10
   (b) Use the small database shown in **fig1**. to illustrate the natural join, and equijoin 10
       and an outer join.

   Table name : Student

Stud_ code	Stud_name	Subject	Prof_code
1	Ashish	OS	30
2	Rahul	DBMS	10
3	Sourabh	GAP	20
4	Nitesh	DWM	10
5	Rajendra	IP	50
6	Pratik	MEIT	30

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Table name : Professor

Prof_code	Prof_name	Phone
10	Savita	96191
20	Smita	98690
30	Bhavna	99543
40	Uttara	78692
70	Keerti	82240

Fig. 1 small database

4. (a) What do you mean by lock granularity ? Explain two-phase locking protocol with   10
   an example.

   (b) Explain with an example how a deadlock condition is created ? List the basic   10
   techniques to control deadlocks.

5. (a) Explain the statement :

   "A transaction is a logical unit of work."   10

   (b) Write a note on transaction support provided by SQL.   10

6. (a) Discuss database recover management.   10

   (b) Explain how to convert an ER-scheme to relational tables with an example.   10

7. Write short notes on (any **four**) :—   20

   (a) COM – DCOM

   (b) Client / server programming

   (c) Activex controls on the web

   (d) GUI features

   (e) Database Administrator.