

**B. Tech. Degree III Semester Examination November 2013**

IT/CS/EC/CE/ME/SE/EB/EI/EE/FT 1301 ENGINEERING MATHEMATICS II

(2012 Scheme)

Time : 3 Hours

Maximum Marks : 100

**PART A**  
(Answer ALL questions)

(8 x 5 = 40)

- I. (a) Find the rank of the matrix.

$$\begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 4 & 5 & 6 \\ 3 & 4 & 5 & 6 & 7 \\ 4 & 5 & 6 & 7 & 8 \end{bmatrix}$$



- (b) Check whether the vectors  $X_1 = (1,1,2)$ ,  $X_2 = (1,2,5)$  and  $X_3 = (5,3,4)$  are linearly dependent or not.
- (c) Find the Laplace transform of  $t^2 u(t-3)$
- (d) Evaluate  $\int_0^{\infty} \frac{e^{-t} - e^{-3t}}{t} dt$
- (e) Find the Fourier sine and cosine integrals of  $f(x) = e^{-kx}$ , for  $x > 0, k > 0$
- (f) Express  $f(x) = x$  as a Fourier cosine series in  $0 < x < 2$
- (g) Find the work done by the force  $\vec{F} = 3xy\vec{i} - y^2\vec{j}$  when it moves a particle along the curve  $y = 2x^2$  in the  $xy$  plane
- (h) Find (i)  $\nabla^2\left(\frac{1}{r}\right)$  where  $r = |\vec{r}|$  and (ii)  $\nabla\left(\frac{1}{r}\vec{r}\right)$

**PART B**

(4 x 15 = 60)

- II. (a) Test for consistency of the following system of equations and solve them if consistent: (8)
- $$\begin{aligned} x_1 + x_2 - x_3 &= 0 \\ 2x_1 - x_2 + x_3 &= 3 \\ 4x_1 + 2x_2 - 2x_3 &= 2 \end{aligned}$$
- (b) Verify Cayley Hamilton theorem and hence find  $A^4$  (7)

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

OR

(P.T.O.)

III. (a) For what values of  $k$  the equations  $x+y+z=1, 2x+y+4z=k, 4x+y+10z=k^2$  have a solution and solve them completely in each case. (10)

(b) Check whether  $W = \{(a, b, 0) : a = b^2, a, b, \in R\}$  is a subspace or not (5)

IV. Find the inverse Laplace transform of

(i)  $\frac{5S+3}{(S-1)(S^2+2S+5)}$  (5)

(ii)  $\tan^{-1}\left(\frac{2}{S}\right)$  (5)

(iii)  $\log\left(\frac{1+S}{S}\right)$  (5)



OR

V. (a) Solve the equation :  $y^{11}-3y^1+2y=4t+e^{3t}$  when  $y(0)=1, y'(0)=-1$  (8)

(b) Apply convolution theorem to evaluate  $L^{-1}\left\{\frac{1}{S(S^2+4)}\right\}$  (7)

VI. (a) Find the Fourier transform of  $e^{-x^2}$  (8)

(b) Solve the integral equation:

$$\int_0^{\infty} F(x) \cos px \, dx = \begin{cases} 1-p & 0 \leq p \leq 1 \\ 0 & p > 1 \end{cases} \quad (7)$$

OR

VII. (a) Obtain the Fourier series for the function  $f(x) = x^2, -\pi < x < \pi$ . Hence show that (10)

(i)  $1 + \frac{1}{2^2} + \frac{1}{3^2} + \dots = \frac{\pi^2}{6}$

(ii)  $1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots = \frac{\pi^2}{12}$

(iii)  $1 + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$

(b) Find the finite Fourier Sine transform of  $f(x) = 2x$  in  $0 < x < 4$  (5)

VIII. (a) Verify divergence theorem for (9)

$\vec{F} = x^2\vec{i} + z\vec{j} + yz\vec{k}$  over the cube formed by  $x = \pm 1, y = \pm 1, z = \pm 1$

(b) Prove that  $\nabla \cdot (\nabla \times \vec{A}) = 0$  for any vector function  $\vec{A}$  (6)

OR

IX. (a) Verify Stoke's theorem for  $\vec{F} = (2x-y)\vec{i} - yz^2\vec{j} - y^2z\vec{k}$  where  $S$  is the upper half of the sphere  $x^2+y^2+z^2=1$  and  $C$  is the circular boundary in the  $XY$  plane. (8)

(b) Show that  $\vec{F} = (y^2+2xz^2)\vec{i} + (2xy-z)\vec{j} + (2x^2z-y+2z)\vec{k}$  is irrotational and hence find its scalar potential. (7)

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## B.Tech. Degree III Semester Examination November 2013

### CS 1302 LOGIC DESIGN (2012 Scheme)

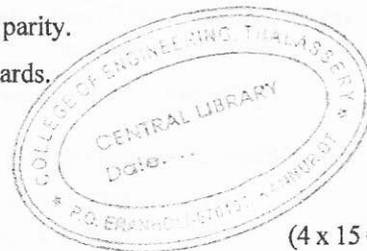
Time : 3 Hours

Maximum Marks : 100

#### PART A (Answer ALL questions)

(8 x 5 = 40)

- I. (a) Convert (i)  $(63.25)_{10}$  to Hexadecimal and octal.  
(ii)  $(117)_{16}$  to BCD and Excess-3 code
- (b) State De-Morgan's theorem. Show that a 2-level AND – OR network is equivalent to 2-level NAND-NAND network.
- (c) Explain a 2-to-4 line decoder. Implement a full adder using ONE 3 input decoder and gates.
- (d) What is a sequential circuit? Explain a JK flipflop with neat circuit diagram and obtain its characteristic table.
- (e) Explain a 4 bit ring counter. Obtain its counting sequence.
- (f) Obtain the hamming code for the message  $(1101)_2$  using odd parity.
- (g) What are hazards? Explain static-1, static-0 and dynamic hazards.
- (h) Explain TTL NAND gate with neat diagram.



#### PART B

(4 x 15 = 60)

- II. (a) What are gray codes? What are its properties? Find the gray code next to the code "10110110" in an 8 bit gray code sequence. (8)
- (b) Simplify;  $F_{(A,B,C,D,E)} = \sum(0, 2, 4, 6, 9, 13, 21, 23, 24, 25, 26, 29, 31)$  that has dont care conditions. (7)  
 $d_{(A,B,C,D,E)} = \sum(8, 10, 16, 18)$ , using k-map method. Implement the circuit using NAND gates only.
- OR**
- III. (a) What are universal gates? With necessary expressions implement NOT, AND, OR and XOR using NAND gates only. (10)
- (b) Using Boolean laws, show that  $AB + \bar{A}C + BC = AB + \bar{A}C$  (5)
- IV. Discuss the disadvantages of parallel adder. With necessary expressions, design a 4-bit "Carry Look Ahead adder" using combinational circuits. (15)

OR

(P.T.O.)

- V. (a) Design a 4:1 multiplexer using gates. (5)  
 (b) Implement the given Pos  $Y = \pi(0,2,4,7)$  on a 4:1 MUX. (5)  
 (c) Reduce the number of states in the following state table and write the reduced table. (5)

Present state	Next State		Output	
	X = 0	X = 1	X = 0	X = 1
a	a	b	0	0
b	c	d	0	0
c	a	d	0	0
d	e	f	0	1
e	a	f	0	1
f	g	f	0	1
g	a	f	0	1

- VI. (a) Explain a 4 bit SISO shift register with neat diagram. (5)  
 (b) Draw the logic diagram of a RAM cell. Explain the control lines. (5)  
 (c) Draw the logical construction of a  $4 \times 3$  RAM module. (5)
- OR**
- VII. (a) Implement a BCD Ripple Counter using JK flipflop and AND gates. Draw its state diagram. (8)  
 (b) Give the block diagram and explain  $((n \times k \times m)$  PLA. Compare PLA and PAL. (7)
- VIII. (a) Explain a "key board – de bounce" circuit using SR latch. (5)  
 (b) Write short notes on: (10)  
 (i) Fan out (ii) Propagation delay (iii) Noise Margin
- OR**
- IX. (a) Draw circuit and explain: (10)  
 (i) DTL NAND gate  
 (ii) CMOS inverter
- (b) Compare TTL and CMOS logic families. (5)

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**B.Tech. Degree III Semester Examination November 2013****CS/IT 1303 DISCRETE COMPUTATIONAL STRUCTURES**  
(2012 Scheme)

Time : 3 Hours

Maximum Marks : 100

**PART A**  
(Answer *ALL* questions)

(8 x 5 = 40)

- I. (a) Define tautology and contradiction with an example.  
 (b) State De-Morgan's Law for logic.  
 (c) Write an algorithm to find the maximum of a finite sequence of numbers.  
 (d) State Pigeohole principle with an example.  
 (e) Write a note on travelling salesman problem in graph theory.  
 (f) Define minimal spanning tree.  
 (g) Consider an algebraic system  $(G, *)$  where  $G$  is the set of all non-zero real numbers and  $*$  is a binary operation defined by  $a * b = \frac{ab}{2}$ . Show that  $(G, *)$  is an abelian group.  
 (h) Define semigroup and lattice.

**PART B**

(4 x 15 = 60)

- II. (a) Prove that  $(p \rightarrow q) \leftrightarrow (\neg p) \vee q$  is a tautology. (7)  
 (b) By mathematical induction, prove that (8)  

$$1^3 + 2^3 + \dots + n^3 = \left[ \frac{n(n+1)}{2} \right]^2$$
- OR**
- III. (a) Determine whether the given arguments are valid or not. (7)  
 (i)  $p \rightarrow q$  (ii)  $p \rightarrow q$   

$$\frac{p}{\therefore q} \quad \frac{q}{\therefore p}$$
  
 (b) Consider  $f, g$  and  $h$ , all functions on the integers by (8)  
 $f(n) = n^2, g(n) = n+1$  and  $h(n) = n-1$ . Determine: (i) hofog (ii) gofoh  
 (iii) fogoh

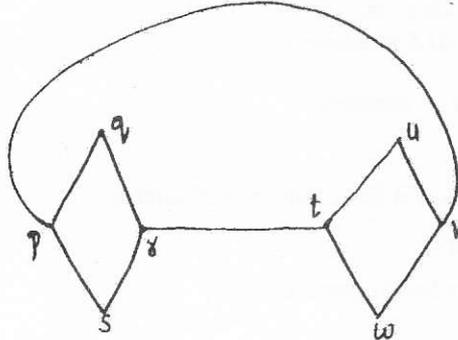
- IV. (a) Solve the recurrence relation  $2a_r - 5a_{r-1} + 2a_{r-2} = 0$  with initial condition (10)  
 $a_0 = 0$  and  $a_1 = 1$   
 (b) From a club consisting of 4 men and 6 women, in how many ways we can select a committee of 3 men and 4 women. (5)

**OR**

- V. (a) Define recursive algorithm and explain the recursive algorithm for finding the factorial of  $n$ . (7)  
 (b) Solve recurrence relation  $a_r - 4a_{r-1} + 4a_{r-2} = 0$  with initial condition (8)  
 $a_0 = 1$  and  $a_1 = 6$

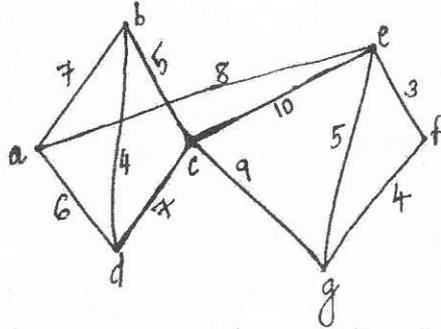
(P.T.O.)

- VI. (a) Prove that the sum of degree of all the vertices in a graph G, is even. (5)  
 (b) Use Fleury's algorithm to find an Euler cycle in the following graph. (10)



OR

- VII. (a) Prove that in any graph, there are an even number of vertices of odd degree. (5)  
 (b) Apply Kruskal's algorithm to find minimal spanning tree of the following graph (10)



- VIII. (a) Let  $A = \{a, b\}$ , which of the following tables defines a semigroup on A? Which define monoid on A? (10)

(i)

*	a	b
a	a	b
b	a	a

(ii)

*	a	b
a	a	b
b	b	a



- (b) Let  $(A, *)$  be a semigroup. For every  $a, b$  in A, if  $a \neq b$  then  $a*b \neq b*a$  and  $a*a = a$  (5)

- (i) show that for every  $a, b$  in A,  $a*b*a = a$   
 (ii) show that for every  $a, b, c$  in A,  $a*b*c = a*c$

OR

- IX. Let  $D_{100} = \{1, 2, 4, 5, 10, 20, 25, 50, 100\}$  and let the relation be 'the divides', be a partial ordering on  $D_{100}$ . Draw the Hasse Diagram. (15)

- (i) Determine the GLB and LUB of B, where  $B = \{5, 10, 20, 25\}$   
 (ii) Determine the GLB and LUB of B, where  $B = \{10, 20\}$

# B.Tech. Degree III Semester Examination November 2013

## CS/IT 1304 OBJECT ORIENTED PROGRAMMING (2012 Scheme)

Time : 3 Hours

Maximum Marks : 100

### PART A (Answer ALL questions)

(8 x 5 = 40)

- I. (a) Is C++ a better language? Justify.  
 (b) Why do we need function declaration in a programme?  
 (c) What is function overloading? Give an example.  
 (d) Differentiate class and object with an example.  
 (e) Draw the pictorial representation of different types of inheritance provided by C++.  
 (f) What is an abstract class? Are they useful in object oriented software development?  
 (g) What is binding? Define static and dynamic binding.  
 (h) What is an exception? Write the syntax of exception handling code in C++. Explain the keywords used and the working.

### PART B

(4 x 15 = 60)

- II. Explain the key concepts of object oriented programming.. (15)  
**OR**  
 III. What is the purpose of functions in a programme? Differentiate between function definition, function declaration and function call with a suitable C++ code. How are member functions defined in a C++ class? (15)

- IV. Design the following classes with suitable data members and member functions (5 x 3 = 15)
- (i) Student
  - (ii) Employee
  - (iii) Bank account
  - (iv) Library book
  - (v) Text file

[Draw the UML notation for classes and write the corresponding C++ code, for each class]

### OR

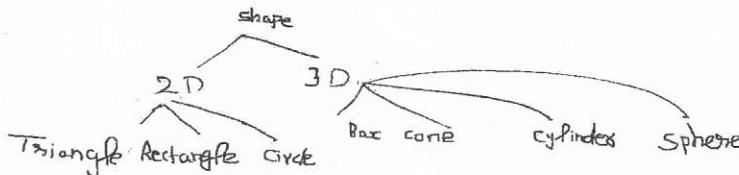
- V. Write a menu-driven programme in C++ with suitable class and members, to find the sum of the specified row or column of a matrix of size  $n \times m$ . If the matrix is square find the sum of the specified diagonal also. (15)

- VI. Write short notes on: (3 x 5 = 15)
- (i) Virtual base class
  - (ii) 'New' and 'delete' operators
  - (iii) Array of printers and pointer to array



### OR

- VII. (a) How is the concept of 'data hiding' implemented in C++? Give an example. (5)  
 (b) Implement the following class hierarchy in C++. (10)



- VIII. Write short notes on: (3 x 5 = 15)
- (i) Templates
  - (ii) Virtual functions
  - (iii) 'String' class in C++

### OR

- IX. Assume there exists a text file "lang.txt" with content "C++ is a beautiful language". Write a C++ programme to append the text "But many students find it difficult to learn and programme in it" to this file. After appending the text, display the entire file in forward and reverse order. (15)

## **B. Tech. Degree III Semester Examination November 2013**

### **CS 1305 PRINCIPLES OF PROGRAMMING LANGUAGES**

(2012 Scheme)

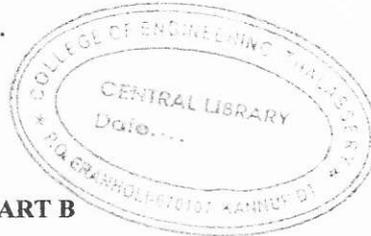
Time : 3 Hours

Maximum Marks : 100

#### **PART A** (Answer *ALL* questions)

(8 x 5 = 40)

- I. (a) Explain the various applications of programming languages.  
(b) What are the factors affecting readability of programming languages?  
(c) Explain the named constants and variable initialization in programs.  
(d) Explain the coroutines.  
(e) Explain the polymorphism and inheritance in object oriented languages.  
(f) What is exception handling? Explain briefly.  
(g) Write short notes on Lambda Calculus.  
(h) What are horn clauses?



#### **PART B**

(4 x 15 = 60)

- II. Define syntax of a programming language. Discuss the formal methods of describing syntax. (15)

**OR**

- III. (a) Explain programming paradigms. (8)  
(b) What is ambiguous grammar? Explain with example. (7)
- IV. (a) Describe the scope and lifetime of a variable. (7)  
(b) Write short note on referencing environment with example. (8)

**OR**

- V. Explain various methods of passing parameter to subprograms with suitable examples. (15)

- VI. (a) Explain the various design issues associated with object oriented languages. (10)  
(b) Explain the features of Java. (5)

**OR**

- VII. (a) Explain the abstraction and encapsulation. (9)  
(b) Describe the features of smalltalk. (6)

- VIII. Explain the functional programming language and its applications. (15)

**OR**

- IX. Describe the programming language, PROLOG and also write the deficiencies of PROLOG. (15)