

S.V.B.Sc Computer Science

Foundation course-II

Mar
2017

Con. 114-17.

(REVISED COURSE)

YC-4629

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(3 Hours)

[Total Marks : 100

N. B. : All questions are compulsory.

Section I

1. Write note on any **three** of the following :— (6x3)
 - (a) National Human Rights Commission
 - (b) Water & Air Pollution
 - (c) Effects of Natural Disasters
 - (d) Characteristics of Effective Leadership
 - (e) Features of Effective Listening.
2. Attempt any **two** of the following :— (8x2)
 - (a) Discuss the Constitutional and Legal Rights of Scheduled Caste and Scheduled Tribes.
 - (b) Both science and technology are interrelated to each other. Comment.
 - (c) Explain the various barriers to effective communication.
3. Answer any **two** of the following :— (8x2)
 - (a) Non verbal communication is equally important to verbal communication. Comment.
 - (b) What is scientific temper ? Discuss its importance.
 - (c) Write an application letter and enclose a resume in response to the following advertisement, "Wanted immediately an experienced accountant for a Glass factory. Apply to P.O. Box 003, Mumbai, 400001".

Section II

4. Write note on any **three** of the following :— (6x3)
 - (a) Consumer Protection Act
 - (b) Eco-Centrism
 - (c) Group Discussion
 - (d) Laser Technology
 - (e) Abraham Maslow's Theory of Motivation.
5. Attempt any **two** of the following :— (8x2)
 - (a) What are the objectives and features of Right to Information Act, 2005 ?
 - (b) Write a detailed note on Right to Education.
 - (c) Eco-Feminism has a root in feminist movement. Discuss its features.
6. Attempt any **two** of the following :— (8x2)
 - (a) Technology makes living easier and comfortable. Discuss.
 - (b) Comment on effective strategies of Time Management.
 - (c) What is PIL ? Focus on its need.

S.Y.B.Sc.

(Computer Sci.)

Mar
2017

P4-Exam.-1st Half-2017-3

Con. 115-17.

Maths - Pap-I

YC-4144

(3 Hours)

[Total Marks : 100

N.B. : (1) All questions are compulsory.

(2) In each question from Q.2 to Q.7 part 'a' is compulsory and solve any one sub question from part 'b' and part 'c'.

(3) Figures to right indicate full marks.

1. Attempt any two of the following :-

10

(a) State Fubini's theorem for rectangular and non-rectangular regions.

(b) Show that $[1,2]$ is a closed set.

(c) Obtain Fourier series expansion of $f(x) = e^x$ in the interval $(-\pi, \pi)$.

2. (a) Prove that every Cauchy sequence in \mathbb{R} is convergent. Is the converse true? Justify. 8

(b) Show that 2 is the only limit point of the set $\left\{2 + \frac{1}{n} : n \in \mathbb{N}\right\}$. 7

(c) Show that there is no rational number x such that $x^2 = 2$. 7

3. (a) Show that every bounded sequence of real numbers have convergent subsequence. 8

(b) Show that $f : [a, b] \rightarrow \mathbb{R}$ is bounded on $[a, b]$ if f is continuous on $[a, b]$. 7

(c) If (x_n) and (y_n) are convergent sequence in \mathbb{R} , then show that $(x_n y_n)$ is also convergent 7

$$\text{and } \lim_{n \rightarrow \infty} x_n y_n = \lim_{n \rightarrow \infty} x_n \lim_{n \rightarrow \infty} y_n.$$

4. (a) State and prove comparison test for infinite series. 8

(b) Using ratio test, discuss convergence of $\sum_{n=1}^{\infty} \frac{x^n}{2^n n^2}$. 7

(c) Find the radius of convergence of the series. 7

(i) $\sum_{n=0}^{\infty} \frac{x^n}{n!}$

(ii) $\sum_{n=0}^{\infty} \frac{(-1)^{n+1} n}{5n^2 + 3}$

[TURN OVER

5. (a) What are exact differential equations ? Write rules to find integrating factors. 8
- (b) Define Bernoulli's equation and further solve differential equation $xy' + y = x^4y^3$. 7
- (c) Solve by method of UDC : $y'' + 4y = x^2$. 7
6. (a) Find the area of region S bounded by $y = x^2$ and the line $y = 2x + 3$. 8
- (b) Verify Fubini's theorem for the integral $\int_0^1 \int_0^{\sqrt{2}} (x^2 + y^2) dy dx$. 7
- (c) Evaluate $\int_0^1 \int_0^x \int_{-y^2}^{x^2} (x+1) dz dy dx$. 7
7. (a) State Green's theorem and verify it over the triangle with vertices (0, 0), (3, 0) and (3, 2) having positively oriented boundary, for $\int (2x - y + 4) dx + (3x + 5y - 6) dy$ 8
- (b) Evaluate in the upper half of unit circle $x^2 + y^2 = 1$, the integral $\int (2 + yx^2) ds$. 7
- (c) Find the divergence of $F(x,y) = (x^2 - y) \bar{i} + (xy - y^2) \bar{j}$. Also, find f such that $F = \nabla f$. 7
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- N.B.** (1) All questions are compulsory.
(2) Figures to the right indicate full marks to the sub-question.
(3) From Questions 2 to 7, sub-question (a) is compulsory. Attempt any one from sub-question (b) and (c).

1. (a) Let U, V be both finite dimensional vector spaces over \mathbb{R} , with $\dim U = n$ and $\dim V = m$ then prove that the space $L(U, V)$ of linear maps from U into V is finite dimensional and $\dim L(U, V) = mn$. 10
(b) Show that $B = \{v_1, v_2, \dots, v_n\}$ is a basis of a vector space V if and only if B is maximal set of generators of V . 10

2. (a) A system $\sum_{j=1}^n a_{ij} x_j = 0, 1 \leq i \leq m$. If $m < n$, then prove that the system has non-trivial solution. 8

- (b) Show that the only solution of the following system is the trivial solution. 7
 $2x - y - 3z = 0, x + y + 4z = 0, -x + 2y - 3z = 0$.

- (c) Reduce the matrix $\begin{bmatrix} 1 & 2 & -1 & 2 & 1 \\ 2 & 4 & 1 & -2 & 3 \\ 3 & 6 & 2 & -6 & 5 \end{bmatrix}$ to row echelon form. 7

3. (a) Let V be a finite dimensional vector space. Let W_1 and W_2 be subspaces of V then prove that $\dim(W_1 + W_2) = \dim W_1 + \dim W_2 - \dim(W_1 \cap W_2)$. 8

- (b) Check whether $S = \{(2, -3, 7), (0, 0, 0), (3, -1, -4)\}$ is linearly dependent or independent. 7

- (c) Show that "Every nonzero singleton set is linearly independent". 7

4. (a) State and prove Cauchy-Schwarz inequality for inner product space. 8

- (b) Show that $\langle x, y \rangle = 2x_1y_1 + x_1y_2 + x_2y_1 + x_2y_2$ is inner product space over \mathbb{R}^2 . 8

- (c) Use Gram Schmidt process to find an orthonormal basis of \mathbb{R}^3 from an linear independent set $\{(0, 1, 1), (1, -1, 0), (2, 0, 1)\}$. 7

5. (a) State and Prove Rank- Nullity theorem. 8

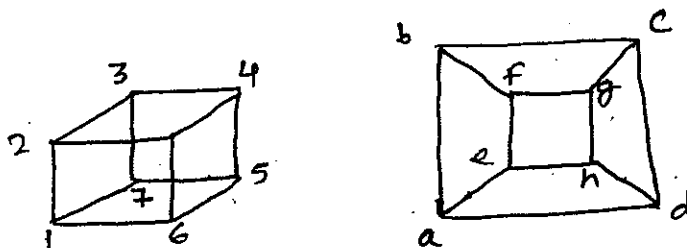
- (b) Show that the dimension of the solution of the system $AX = 0$ is $n - \text{rank } A$. 7

- (c) Show that $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ defined by $T(x, y) = (x + y, x - y)$ is invertible. 7

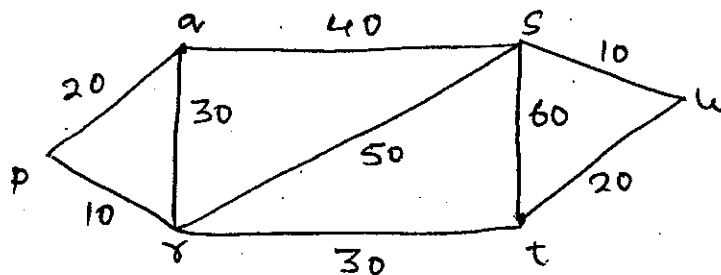
6. (a) Let A be $n \times n$ matrix over \mathbb{R} , $\sigma \in S_n$ and $A = (R_1, R_2, \dots, R_n)$ then prove that $D(R_{\sigma(1)}, R_{\sigma(2)}, \dots, R_{\sigma(n)}) = \epsilon(\sigma) D(R_1, R_2, \dots, R_n)$. 8
- (b) Show that the equations $x + 2y - z = 3$, $3x - y + 2z = 1$, $2x - 2y + 3z = 2x - y + z = -1$ are consistent and solve them. 7
- (c) For an $n \times n$ matrix A over \mathbb{R} , show that $\det(A^t) = \det(A)$. 7
7. (a) Let λ be an eigen value of a linear T . Prove that λ^2 is an eigen value of T^2 . Also prove in generally λ^k is an eigen value of T^k . 8
- (b) Find Eigen values and Eigen vectors of the matrix $A = \begin{bmatrix} 1 & 2 & 4 \\ 1 & -1 & 4 \\ 1 & 2 & 3 \end{bmatrix}$. 7
- (c) If A is an invertible square matrix, prove that any matrix B with $A \sim B$ is also invertible. 7

- N.B. :** (1) All questions are compulsory.
 (2) All questions carry equal marks.
 (3) Figures to the right indicate full marks.
 (4) Use of Non-Programmable Scientific Calculator is Allowed.

1. (a) Design an algorithm to find all Primes between 1 to 100. 7
 (b) Attempt any two :-
 (i) Design an algorithm to find whether an input number is even or not. 4
 (ii) Write an Algorithm to find factorial of Positive integer. 4
 (iii) Design an algorithm to find sum of first five odd integers. 4
2. (a) State and Prove Euler's theorem for Planar Graphs. 7
 (b) Attempt any two :-
 (i) Draw all Possible Subgraphs of K_4 . 4
 (ii) Check whether the following graphs are Isomorphic or Not. 4



- (iii) Show that the number of odd degree vertices in any graph are even in number. 4
3. (a) Write Steps in Prim's Algorithm for weighted graph and find minimum Spanning Tree by using Prim's Algorithm for following graph. 7



- (b) Attempt any two :-
 (i) Define Connected and k-Regular Graph with example. 4
 (ii) Define Eulerian and Hamilton Graph with Examples. 4
 (iii) Check whether the following graphs are Planar or Not. 4
 (p) K_{43} (q) K_5 .

[TURN OVER

4. (a) Find the Volume of Solid obtained by revolving ellipse $x = 2 \cos t$ and $y = 3 \sin t$ about Y-axis where $0 \leq t \leq \pi$. 7
- (b) Attempt any two :-
- (i) Evaluate $\int_0^{\infty} 7^{-3x^2} dx$ 4
- (ii) Evaluate $\int_0^{\infty} \frac{1}{1+t^2} dt$ 4
- (iii) Find the Area of $y = x$ about Y-axis from 0 to 2. 4
5. (a) Solve $x + y + z = 10$, $3x - 2y + z = 8$ and $x + 10y - 8z = 10$ by using DoLittile's Decomposition method. 7
- (b) Attempt any two :-
- (i) Find the root of the equation $\cos x = x$ by False position method. 4
- (ii) Solve $x^3 + 2x - 2 = 0$ by using Bisection method. 4
- (iii) Derive a formula to calculate square root of positive real number by Newton Raphson method. 4
6. (a) Derive the formula for Euler's modified method. 7
- (b) Attempt any two :-
- (i) By Milne Simpsons predictor-corrector method to solve $\frac{dy}{dx} = x + y$ given $y(0) = 1$ find $y(0.2)$. 4
- (ii) By Taylor's Method solve $\frac{dy}{dx} = 1 + y^2$ find $y(0.3)$ given $y(0) = 1$. 4
- (iii) By Euler's Method solve $\frac{dy}{dx} = x + y$ given $y(0) = 1$ and find $y(1)$ 4
take $h = 0.25$

- N. B. :** (1) All questions are compulsory.
(2) Figures to the right indicate marks.
(3) All question carry equal marks.

1. Attempt the following (any two) :— 10
(a) Solve the recurrence relation : $a_{r+2} - 2a_{r+1} + a_r = 2r$.
(b) With $a_0 = 1$ and $a_1 = 2$. Find first 5 terms in sequence $\{a_n\}$ whose recurrence relation is $a_n = 5a_{n-1} - 3a_{n-2}$.
(c) Consider the set $A = \{4, 5, 6, 7\}$. Let R be the relation \leq on A . Draw the directed graph and the Hasse diagram of R .
2. Attempt the following (any two) :— 10
(a) State the Depth First Algorithm.
(b) State the Breadth First Algorithm.
(c) Let E denote the following algebraic expression :
 $[a + (b - c)] * [(d - e) / (f + g - h)]$.
3. Attempt the following (any two) :— 10
(a) Determine the number of ways in which 5 software engineers and 6 electronic engineers be seated so that no two s/w engineers be seated together.
(b) Find number of permutation for the letter EXPRESSION & LAMITATION.
(c) How many 4 digit numbers can be formed by using the digits 2, 4, 6, 8 when repetition of digit is allowed.
4. Attempt the following (any two) :— 10
(a) State DDA Line Algorithm
(b) What is Reflection Transformation ? What are its various forms ? Explain with diagram.
(c) What are the applications of Computer Graphics ?
5. Attempt the following (any two) :— 10
(a) Write the properties of Bazier Curves.
(b) What is point clipping ? Explain Inside - Outside Test.
(c) Write a short note on Workstation transformation.
6. Attempt the following (any two) :— 10
(a) Discuss the steps in Animation.
(b) Write a short note on Texture Mapping.
(c) What are the different Shading Technique ? Explain any one in details.

- N. B. :** (1) All questions are **compulsory**.
(2) Figures to the **right** indicate marks.
(3) Mixing of sub-questions is **not allowed**.
(4) Answers to **both** the sections have to be written in **same** answer book.

Section I

1. Attempt any **two** :—
- (a) Write a short note on : (i) Class (ii) Object. 5
 - (b) Define inline function with appropriate syntax. Write one suitable example. 5
 - (c) Write a C++ program to display average of two numbers. 5
2. Attempt any **two** :—
- (a) Write a note on Simple Inheritance. 5
 - (b) Describe basic data types in C++. 5
 - (c) Write syntax for defining derived classes. Discuss with examples. 5
3. Attempt any **two** :—
- (a) Write a short note on try and catch block. 5
 - (b) What are the components of Standard Template Library ? 5
 - (c) Explain with an example, how to open and close a file in C++. 5

Section II

4. Attempt any **two** :—
- (a) List and explain the features of Java. 5
 - (b) Explain the purpose of Access modifier in class. 5
 - (c) Write a Java program to find the sum of all integers greater than 50 and less than 100. 5
5. Attempt any **two** :—
- (a) Explain difference between Call by Value & Call by reference in Java ? 5
 - (b) What do you understand by Exception Handling ? 5
 - (c) Write a program with an interface Shape which has a method draw (). Write two classes Square and Cube which implement the interface. Test the classes created. 5
6. Attempt any **two** :—
- (a) Explain with an example InputStream and OutputStream. 5
 - (b) What is Applet ? Explain the basic structure of Applet. 5
 - (c) Define a class to accept 10 numbers into an array and print the difference between the sum of even positioned elements and the odd positioned elements. 5

- N. B. :** (1) All questions are **compulsory**.
(2) All questions carry **equal marks**.
(3) Draw diagrams wherever **necessary**.

Section I

1. Attempt any **two** of the following :— 5
- (a) Explain the purpose of DBMS. 5
- (b) Define the following terms : 5
- (i) Super Key
- (ii) Tuple
- (iii) Domain
- (iv) Foreign key
- (v) Table.
- (c) Discuss integrity concept in detail. 5
2. Attempt any **two** of the following :—
- (a) Write the syntax for the following with example— 5
- (i) Update (ii) Select
- (b) Explain types of functions with 2 examples of each. 5
- (c) Consider the following relations. 5
- Student (Stud_id, Stud_name, Stud_add, Stud_phone)
- Book (Book_id, Book_name, Book_Author)
- Book_Issue_details (Book_id)
- Enter two more required attributes in each relation and solve the following queries.
- (i) Calculate the overall cost of books.
- (ii) Display details of Students staying at 'Mumbai', 'Pune', 'Thane'.
- (iii) Get a list of books issued on 13th May 2016.
- (iv) Generate a list according to publication in reverse order.
- (v) Display a monthly report showing Student, Book detail.
3. Answer any **two** of the following :—
- (a) State advantages and disadvantages of view. 5
- (b) Discuss joins. 5
- (c) Why use stored procedures ? 5

Section II

4. Attempt any **two** of the following :—
- (a) Discuss SDLC. 5
 - (b) What is the purpose of Software Engineering ? 5
 - (c) Explain the RAID Model. 5
5. Attempt any **two** of the following :—
- (a) Explain the following— 5
 - (i) Feasibility study
 - (ii) SQA
 - (b) Draw a DFD for food Ordering System. (Upto first level) 5
 - (c) What is Risk ? Explain various Risk Management activities. 5
6. Attempt any **two** of the following :—
- (a) Distinguish between 5
 - (i) Cohesion and Coupling
 - (ii) Verification and Validation.
 - (b) What is testing ? Explain it with its principles and objectives. 5
 - (c) Draw a ERD and Use Case diagram for ATM. 5
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