SEX CMPN / Sem-IV / Paper / Subject Code: 40501 / Applied Mathematics-IV / NOV. 2019
CHOICE BASED

(3 hours) Max. Marks: 80

N.B. (1) Question No. 1 is compulsory.
(2) Answer any three questions from Q.2 to Q.6.
(3) Use of Statistical Tables permitted.
(4) Figures to the right indicate full marks.

Q.1 (a) Find all the basic solutions to the following problem: 05

Maximise $z = x_1 + 3x_2 + 3x_3$

subject to $x_1 + 2x_2 + 3x_3 = 4$

$2x_1 + 3x_2 + 5x_3 = 7$

$x_1, x_2, x_3 \geq 0$

(b) Evaluate $\int_c \left(z - z^2\right) dz$, where c is upper half of the circle $|z| = 1$. 05

(c) Ten individual are chosen at random from a population & heights are found to be 63, 63, 64, 65, 66, 69, 69, 70, 70, 71.inches. Discuss the suggestion that the height of universe is 65 inches. 05

(d) If $A = \begin{bmatrix} 2 & 3 \\ -3 & -4 \end{bmatrix}$, find A^{100} 05

Q.2 (a) Evaluate $\int_c \frac{z+2}{(z-3)(z-4)} dz$, where c is the circle $|z| = 1$ 06

(b) An I.Q. test was administered to 5 persons and after they were trained. The results are given below. 06

	I	II	III	IV	V
I.Q. Before training	110	120	123	132	125
I.Q. after training	120	118	125	136	121

Test whether there is any change in I.Q. after the training programme, use 1% LOS.

(c) Solve the following LPP using Simplex Method 08

Maximise $z = 4x_1 + 10x_2$

subject to $2x_1 + x_2 \leq 10$

$2x_1 + 5x_2 \leq 20$

$2x_1 + 3x_2 \leq 18$

$x_1, x_2 \geq 0$

Q.3 (a) Find the Eigen values and Eigen vectors of the following matrix. 06

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

[Turn over

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(b) If the height of 500 students is normally distributed with mean 68 inches and standard deviation 4 inches. Find the expected number of students having heights between 65 & 71 inches. 06

(c) Obtain Taylor's and Laurent's expansions of $f(z)=\dfrac{z^2-1}{z^2+5z+6}$ around $z=0$ 08

Q.4 (a) A machine is claimed to produce nails of mean length 5 cms & standard of 0.45 cm. A random sample of 100 nails gave 5.1 as their average length. Does the performance of the machine justify the claim? Mention the level of significance you apply. 06

(b) Using the Residue theorem, Evaluate $\displaystyle\int_0^{2\pi} \frac{d\theta}{5+3\sin\theta}$ 06

(c) (i) In a certain manufacturing process 5% of the tools produced turnout to be defective. Find the probability that in a sample of 40 tools at most 2 will be defective.

(ii) A random variable x has the probability distribution 04+04

$P(X=x_i)=\frac{1}{8}{}^3C_x$, $X=0,1,2,3$. Find the moment generating function of x

Q.5 (a) Check whether the following matrix is Derogatory or Non-Derogatory:

$$A=\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$ 06

(b) In an industry 200 workers employed for a specific job were classified according to their performance & training received to test independence of training received & performance. The data are summarized as follows. 06

Performance	Good	Not good	Total
Trained	100	50	150
Untrained	20	30	50
Total	120	80	200

Use χ^2-test for independence at 5% level of significance & write your conclusion.

(c) Use the dual simplex method to solve the following L.P.P. 08

Minimise $z=2x_1+x_2$

subject to $3x_1+x_2\geq 3$

$4x_1+3x_2\geq 6$

$x_1+2x_2\leq 3$

$x_1,x_2\geq 0$

[Turn over

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Q.6 **(a)** Show that the matrix A satisfies Cayley-Hamilton theorem and hence find A^{-1}.

Where $A = \begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$ **06**

(b) A discrete random variable has the probability density function given below

$X = x_i$	-2	-1	0	1	2	3
$P(x_i)$	0.2	K	0.1	2K	0.1	2K

06

Find K, Mean, Variance.

(c) Using Kuhn-Tucker conditions, solve the following NLPP

Maximise $z = 2x_1^2 - 7x_2^2 + 12x_1x_2$

subject to $2x_1 + 5x_2 \le 98$ **08**

$x_1, x_2 \ge 0$

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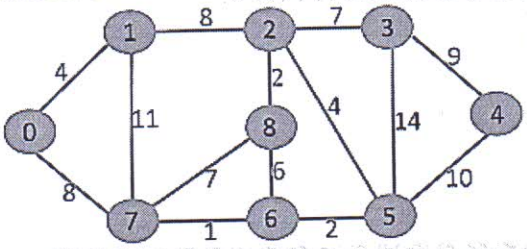
S/Sem-IV - MPN / choice based. / Paper / Subject Code: 40502 / Analysis of Algorithms / Dec-2019

(3 Hours) [Total Marks : 80]

N.B.: (1) **Question No. 1** is **compulsory**.
(2) Attempt **any three** out of the remaining **five** questions.
(3) Assumptions made should be **clearly stated**.

1. (a) Explain recurrences and various methods to solve recurrences. 5
   (b) Differentiate between P and NP. 5
   (c) Differentiate between Prims and Kruskals algorithm. 5
   (d) Explain Dynamic programming with example. 5

2. (a) Define Branch and Bound and Explain 15 Puzzle problem. 10
   (b) Apply dijkstra's algorithm on the following graph. 10
   Consider vertex 0 as source.



3. (a) Find Longest Common Subsequence for Following strings : 10
   X = ababcde
   Y = bacadb
   (b) Explain Backtracking with n-queen problem. 10

4. (a) Formulate Knapsack problem , Explain and differentiate between greedy knapsack and 0/1 knapsack. 10
   (b) Explain Multistage graph with example. 10

5. (a) Rewrite KMP algorithm and explain with example. 10
   (b) Define chromatic number of graph. Explain Graph coloring algorithm. 10

6. Write a short note on following **(any 4)** : 20
   a) Master theorem
   b) Rabin Karp algorithm
   c) Steps for NP Completeness proofs
   d) Assembly line scheduling problem
   e) Strassen's matrix multiplication

Sem - IV / Paper / Subject Code: 40503 / Computer Organization and Architecture / Nov - 2019

Computer - Choice Based

(3 Hours) [Total Marks: 80]

NB: 1. Question No.1 Compulsory.

2. Solve any THREE from Q.2 to Q.6

3. Assume suitable data whenever necessary with justification.

Q.1 Answer **any four** questions

(a) Describe the memory hierarchy in the computer system [05]

(b) Give different instruction formats. [05]

(c) Explain principle of locality of reference in detail [05]

(d) Differentiate between Memory Mapped IO and IO Mapped IO. [05]

(e) Explain Superscalar Architecture. [05]

Q.2 (a) A program having 10 instructions (without Branch and Call instructions) is executed on non-pipeline and pipeline processors. All instructions are of same length and having 4 pipeline stages and time required to each stage is 1nsec. [10]

i. Calculate time required to execute the program on Non-pipeline and Pipeline processor.

ii. Calculate Speedup.

(b) With a neat diagram , explain branch prediction in detail. [10]

Q.3. (a) Explain page address translation with respect to virtual memory and further explain TLB in detail. [10]

(b) What is "Microprogram"? Write microprogram for following operations. [10]

i. ADD R1, M, Register R1 and Memory location M are added and result store at Register R1.

ii. MUL R1, R2 Register R1 and Register R2 are multiplied and result store at Register R1.

Q.4 (a) Explain Bus Contention and different method to resolve it. [10]

(b) Define instruction pipelining and its various hazards in detail. [10]

Q.5. (a) Explain multi core processor architecture in detail [10]

(b) Explain Booth's Multiplication algorithm and Perform $(17)_{10}$ X $(-5)_{10}$. [10]

Q.6 Write short notes on any **two** [20]

(a) Data transfer techniques

(b) Set associative cache mapping

(c) Flynn's Classification

(d) Control unit of processor

E / Sem - IV / Paper / Subject Code: 40504 / Computer Graphics / Dec - 2019.
CMPN
Choice based.

[Time: Three Hours] **[Marks: 80]**

Please check whether you have got the right question paper.

N.B: (1) Question No.1 is compulsory
(2) Attempt any three of remaining five questions
(3) Assume any suitable data if necessary and justify the same

Q 1	a)	Define the following terms: Resolution, Aspect Ratio, Phosphorescence and Fluorescence.	05
	b)	What is the purpose of Inside-Outside Test, explain any one method.	05
	c)	Draw the diagram of CRT and explain its working.	05
	d)	What do you understand by Control points, Degree of Continuity, Local and Global control w.r.t. Curve Generation?	05
Q 2	a)	Explain DDA Line drawing algorithm and Plot the points for line AB (A (10, 15) B (5,25) using it.	10
	b)	Explain Area subdivision algorithm for hidden surface removal.	10
Q 3	a)	What is aliasing, how it affects the appearance of an object. Explain any two Anti-aliasing methods.	10
	b)	Explain Liang Barsky line clipping algorithm, what is its benefit over Cohen Sutherland algorithm? Clip the line with co-ordinates (5, 10) and (35, 30) against the window $(x_{min}, y_{min}) = (10, 10)$ and $(x_{max}, y_{max}) = (20, 20)$.	10
Q 4	a)	What is shading? Explain Gouraud and Phong Shading with their pros and cons.	10
	b)	Explain what is meant by B Spline curve? State the various properties of B Spline curve.	10
Q 5	a)	Explain Scan line polygon fill algorithm with the help of suitable diagrams.	10
	b)	Explain the steps for 2D reflection w.r.t. line y=mx and also derive a composite transformation Matrix.	10
Q 6		Write short notes on (any two)	20
	a)	Fractals	
	b)	Sweep Representation and CSG Method	
	c)	Bezier curve and the properties	
	d)	Halftone and Dithering	

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