CBCS SCHEME

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18SFC/LNI/SCE/SCS/SCN/SSE/SIT/SAM11

First Semester M.Tech. Degree Examination, Dec.2018/Jan.2019
Mathematical Foundation of Computer Science

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Perform one iteration of the Bairstow method to extract a quadratic factor of the form $x^2 + px + q$ from the equation $x^3 + x^2 - x + 2 = 0$. Use initial approximations $P_0 = -0.9$ and $q_0 = 0.9$. **(10 Marks)**

b. Using Jacobi method, find all the eigen values and the corresponding eigen vectors of

$$A = \begin{pmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{pmatrix}.$$ **(10 Marks)**

OR

2 a. Find all the roots of the polynomial $x^4 - x^3 + 3x^2 + x - 4 = 0$ using Graeffe's root squaring method. **(10 Marks)**

b. Transform $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 1 & -1 \\ 3 & -1 & 1 \end{pmatrix}$ to tridiagonal form by Given's method. **(10 Marks)**

Module-2

3 a. Psychological tests of intelligence and of engineering ability were applied to 10 students. Here is a record of ungrouped data showing intelligence ratio (IR) and engineering ratio (ER). Calculate the co-efficient of correlation. **(10 Marks)**

Student	A	B	C	D	E	F	G	H	I	J
IR	105	104	102	101	100	99	98	96	93	92
ER	101	103	100	98	95	96	104	92	97	94

b. Fit a second degree parabola $y = a + bx + cx^2$ to the following data. **(10 Marks)**

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

OR

4 a. The two regression equations of the variables x and y are $x = 19.13 - 0.87y$ and $y = 11.64 - 0.5x$. Find i) Mean of x's ii) Mean of y's iii) the correlation coefficient between x and y. **(10 Marks)**

b. Fit curve of the form $y = ax^b$ to the given data. **(10 Marks)**

x	350	400	500	600
y	61	26	7	26

Module-3

5 a. Explain i) Discrete random variable ii) Continuous random variable. **(10 Marks)**

b. Five dice were thrown 96 times and the numbers 1, 2 or 3 appearing on the face of the dice follows the frequency distribution as below :

No. of dice showing 1, 2 or 3	5	4	2	1	0	3
Frequency	7	19	24	8	3	35

Test the hypothesis that the data follows a binomial distribution. Given that $X^2_{0.05} = 11.07$ for 5 df. **(10 Marks)**

OR

6 a. The probability density function of a variate X is

X	0	1	2	3	4	5	6
P(x)	K	3K	5K	7K	9K	11K	13K

Find K , $P(X < 4)$, $P(X \geq 5)$, $P(3 < X \leq 6)$. **(10 Marks)**

b. A certain stimulus administered to each of the 12 patients resulted in the following change in blood pressure 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4. Can it be concluded that the stimulus will increase the blood pressure? Given that $t_{0.5}$ for $11d_f$ is 2.201. **(10 Marks)**

Module-4

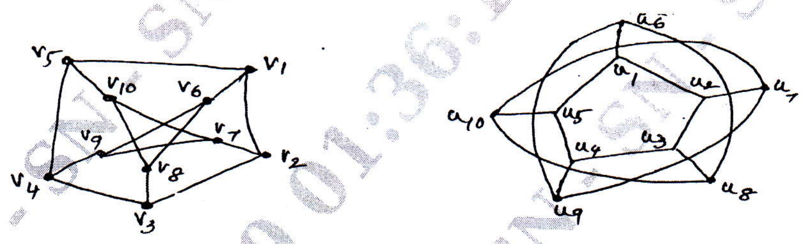
7 a. Define i) Hamilton cycle ii) Hamilton graph iii) Hamilton path. **(10 Marks)**

b. Prove that the vertices of every connected simple planar graph can be properly coloured with five colours. **(10 Marks)**

OR

8 a. Find the number of non negative integer solutions of the equation $x_1 + x_2 + x_3 + x_4 = 25$. **(10 Marks)**

b. Verify whether the following two graphs are isometric or not. **(10 Marks)**



Module-5

9 a. Verify the vectors $\alpha_1 = (1, 0, -1)$, $\alpha_2 = (1, 2, 1)$ and $\alpha_3 = (0, -3, 2)$ are linearly independent. Also find whether these vectors forms a basis for R^3? **(10 Marks)**

b. The vectors $\alpha_1 = (1, 2)$, $\alpha_2 = (3, 4)$ are linearly independent and form a basis for R^2. If a transformation exists from R^2 into R^3 such that $T\alpha_1 = (3, 2, 1)$ and $T\alpha_2 = (6, 5, 4)$, then show that it is linear. **(10 Marks)**

OR

10 a. Let F be a subfield of the complex numbers. Consider the matrix

$P = \begin{pmatrix} -1 & 4 & 5 \\ 0 & 2 & -3 \\ 0 & 0 & 8 \end{pmatrix}$. Clearly the columns of P, the vectors $\alpha_1^1 = (-1, 0, 0)$, $\alpha_2^1 = (4, 2, 0)$,

$\alpha_3^1 = (5, -3, 8)$ form a basis B of F^3. Express the coordinates x_1^1 , x_2^1 , x_3^1 of the vector in the basis B $\alpha = (x_1^1, x_2^1, x_3^1)$ in terms of x_1, x_2, x_3. Also express (3, 2, 8) in terms of α_1^1 , α_2^1 , α_3^1. **(10 Marks)**

b. Find the basis for the eigen space of the linear transformation $T : R^2 \rightarrow R^2$ defined by $T(x, y) = (x + y, y)$. **(08 Marks)**