CBCS SCHEME

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18SCN/SCS/SFC/LNI/SCE/SSE/SIT11

# First Semester M.Tech. Degree Examination, June/July 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.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

## Module-1

1 a. Explain in brief : i) Significant figures ii) Truncation error iii) Inherent error iv) Accuracy and Precision v) Round – off error. **(10 Marks)**

b. Perform two iterations of the Bairstow method to extract a quadratic factor $x^2 + Px + q$ from the polynomial $x^3 + x^2 - x + 2 = 0$. Use the initial approximations as -0.9 and 0.9. **(10 Marks)**

**OR**

2 a. Find all the roots of the polynomial $x^3 - 6x^2 + 11x - 6 = 0$ using the Graeffe's root squaring method. Carry out 3 iterations. **(10 Marks)**

b. Using the Jacobi method find all the Eigen values and the corresponding Eigen vectors of the matrix.

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

**(10 Marks)**

## Module-2

3 a. Ten students got the following percentage of marks in Economics and Statistics.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Roll No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Marks in Economics | 78 | 36 | 98 | 25 | 75 | 82 | 90 | 62 | 65 | 39 |
| Marks in Statistics | 84 | 51 | 91 | 60 | 68 | 62 | 86 | 58 | 53 | 47 |

Calculate the coefficient of correlation. **(10 Marks)**

b. Fit a Parabola $y = a + bx + cx^2$ by the method of least squares to the following data. **(10 Marks)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| y | 2.3 | 5.2 | 9.7 | 16.5 | 29.4 | 35.5 | 54.4 |

**OR**

4 a. Find the coefficient of correlation and obtain the lines of regression for the following data :

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| y | 9 | 8 | 10 | 12 | 11 | 13 | 14 | 16 | 15 |

Determine Y which corresponds to x = 6.2. **(10 Marks)**

b. Determine the best fitting straight line for the following data of the form y = a + bx. **(10 Marks)**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| x | 1 | 3 | 4 | 6 | 8 | 9 | 11 | 14 |
| y | 1 | 2 | 4 | 4 | 5 | 7 | 8 | 9 |

## Module-3

5 a. The probability distribution of a finite random variable X is given by the following table :

| $X_i$ | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| $P(X_i)$ | 0.1 | K | 0.2 | 2K | 0.3 | K |

i) Determine the value of K and find the mean variance and standard deviation.
ii) Find : $P(X < 1)$ , $P(-1 < X \leq 2)$ , $P( X > -1)$. **(10 Marks)**

b. A certain stimulus administered to each of 12 Patients resulted in the following change in blood pressure : 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 04 (in appropriate units). Can it be concluded that on the whole, the stimulus will change the blood pressure. Use $t_{0.05}(11) = 2.201$. **(10 Marks)**

**OR**

6 a. A random variable x has the density function

$$P(x) = \begin{cases} Kx^2, & 0 \leq x \leq 3 \\ 0, & \text{elsewhere} \end{cases}$$ . Evaluate K and find

i) $P(x \leq 1)$ ii) $P(1 \leq x \leq 2)$ iii) $P(x \leq 2)$ iv) $P(x > 1)$ v) $P(x > 2)$. Also determine the mean , variance and the standard deviation of the distribution. **(10 Marks)**

b. A die is thrown 60 times and the frequency distribution for the number appearing on the face x is given by the following table.

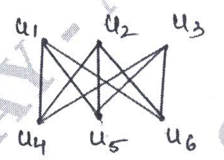
| X | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Frequency | 15 | 6 | 4 | 7 | 11 | 17 |

Test the hypothesis that the die is unbiased. Use $\chi^2_{0.01}(5) = 15.09$ , $\chi^2_{0.05}(5) = 11.07$. **(10 Marks)**

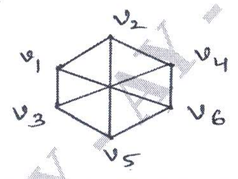
## Module-4

7 a. Define Isomorphism of graphs. Show that the following two graphs are isomorphic. **(10 Marks)**

i)




ii)




b. Define i) Euler circuit and ii) Hamilton cycle in graph G iii) Hamilton path. **(10 Marks)**

**OR**

8 a. Show that the complete graphs $K_2$, $K_3$ and $K_4$ are planar graphs. **(10 Marks)**

b. Find the number of integer solution of the equation $x_1 + x_2 + x_3 + x_4 + x_5 = 30$. Under the constraints $x_i \geq 0$ for i = 1, 2, 3, 4, 5 and further $x_2$ is even and $x_3$ is odd. **(10 Marks)**

## Module-5

9 a. Define vector space and subspace. Give example. **(10 Marks)**

b. Determine whether the vectors $f(x) = 2x^3 + x^2 + x + 1$ , $g(x) = x^3 + 3x^2 + x - 2$ and $h(x) = x^3 + 2x^2 - x + 3$ in the vector space R[x] of all polynomials over the real number field are linearly independent or not. **(10 Marks)**

**OR**

10 a. Define Basis and Dimensions of a vector space. Determine whether or not each of the following sets form a basis of $R^3(R)$ : i) $B_1 = \{(1, 1, 1), (1, 0, 1)\}$
ii) $B_4 = \{(1, 1, 2), (1, 2, 5), (5, 3, 4)\}$. **(10 Marks)**

b. Show that the transformation $y_1 = 2x_1 + x_2 + x_3$ , $y_2 = x_1 + x_2 + 2x_3$ , $y_3 = x_1 - 2x_3$ is regular. Write down the inverse transformation. **(10 Marks)**

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