Department of Information and Communication Engineering

Pabna University of Science and Technology

Faculty of Engineering and Technology

B.Sc. (Engineering) 2nd Year 1st Semester Examination-2017

Session: **2015-16**

Course Code: **ICE-2101** Course Title: **Digital Electronics**

NB:	
	1. Answer any <u>SIX</u> (THREE from each PART) questions.
	2. Figures in the right margin indicate marks.
	3. Parts of the same question should be answered together and in the same sequence.
	4. Separate answer script must be used for answering the question of **PART-A** and **PART-B**.

Time: 3 Hours **Total Marks: 70**

PART-A

1. a) Define Digital Electronics. Write the advantages and disadvantages of Digital Electronics. 3

   b) With simple switching circuits demonstrate binary logic. 3

   c) What do you mean by number base conversion? Convert the following numbers: 3

      i) $(101100.001)_2$ to $(\ )_{10}$

      ii) $(12121)_3$ to $(\ )_{10}$

   d) What do you mean by complement of a number? Describe (r-1)'s complement with suitable example. $2\frac{2}{3}$

2. a) Subtract $(11010)_2$ from $(10010)_2$ using 2's complement method. Why do you need 2's complement method? 3

   b) Apply the input waveforms A, and B of Figure-1 to a NAND gate, and draw the output waveform, D. Then Apply the output waveform D, and input waveform C of Figure-1 to a NOR gate, and draw again the resultant waveform, R. 2

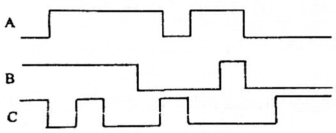


Figure-1

   c) Show that a two-input NAND gate can be constructed from two-input NOR gate. Simplify the following: $(\overline{A+B})(\overline{\bar{A}+\bar{B}})$. 4

   d) What are min terms and max terms? Give example. $2\frac{2}{3}$

3. a) With example explain conversion between Canonical forms. 4

   b) What do you mean by simplification of Boolean expression? Write the advantages of it. 2

   c) Reduce the following Boolean Expression to the required number of literals using Boolean algebra. 3

      i) $ABC + A'B'C + A'BC + ABC' + A'B'C'$ to five literals

      ii) $BC + AC' + AB + BCD$ to four literals.

   d) Simplify the following Boolean functions using map methods: $2\frac{2}{3}$

$$F(w,x,y,z) = \sum(0,1,2,4,5,6,8,9,12,13,14).$$

4. a) Define Don't care condition. Write the use of Don't care condition. $2\frac{2}{3}$

   b) Explain prime implicants and essential prime implicants. 3

   c) What do you mean by Tabulation method? Simplify the following Boolean function $F = \sum(1,4,6,7,8,9,10,11,15)$ using Tabulation method. 6

PART-B

5. a) What do you mean by Combinational logic? Write down the procedural steps that are usually involved to design a combinational circuit. $3\frac{2}{3}$

   b) Describe the principle of a full-subtractor circuit with suitable logic diagram, characteristics table, and equations. 4

   c) Show that a full-adder can be constructed with two-half adder and an OR gate. 4

6 a) Design a BCD-to-Decimal decoder and write the role of don't care condition in this case. 4

b) Define Demultiplexer. Design a 2-to-4 line decoder with enable input and explain it. 3

7. a) Define flip-flop and latch. Write the difference between them. 3

b) Draw the logic diagram of Clocked D flip-flop. Write the operation of Clocked D flip-flop using truth table and also derive characteristics equation. Why it is called D flip-flop. Using D flip-flop which problem of S-R flip-flop is solved? 6

c) What do you mean by triggering of flip-flop? Draw negative and positive pulses. How multiple transition problems can be eliminated? $2\frac{2}{3}$

8. a) What is sampling and quantization? What are the applications of ADC and DAC? 3

b) Explain the read and write operation of a RAM with suitable diagram. 5

c) What is the difference between the registers and shift registers? $2\frac{2}{3}$

d) Why cache memory is needed? 1

Department of Information and Communication Engineering

Pabna University of Science and Technology, Pabna

Faculty of Engineering and Technology

B.Sc. Engineering 2nd Year 1st Semester Examination-2017

Session: 2015-2016

Course Code: **ICE-2103** Course Title: **Object Oriented Programming**

NB:
1. Answer any **THREE** questions out of four from each **PART.**
2. Figures in the right margin indicate full marks.
3. Parts of the same question should be answered together and in the same sequence.
4. Separate answer script must be used for answering the questions of **PART-A** and **PART-B**.

Time: 3 Hours (For Part A and Part B) **Total Marks: 70**

PART-A

1. a) What is Object oriented programming (OOP)? Briefly discuss about the term Polymorphism. 4
   b) What do you understand by data abstraction, encapsulation, polymorphism, and dynamic binding? 4
   c) What are the major C++ features that were intentionally omitted from Java or significantly modified? $3\frac{2}{3}$

2. a) Write down some new operators that introduce in C++ programming language. 3
   b) What are the differences between class and structure? 3
   c) Briefly describe the single inheritance in C++ programming language. $5\frac{2}{3}$

3. a) Define constructors and destructors in C++ programming language. 3
   b) What are the special characteristics of the constructor functions? $4\frac{2}{3}$
   c) What are the differences between C++ and Java programming language? 4

4. a) What do you mean by Operator Overloading in C++ programming language? 2
   b) Write C++ program to perform addition, subtraction, multiplication and division of two integers. $5\frac{2}{3}$
   c) Write down two normal uses of void in C++ programming language. 2
   d) What do you mean by abstract class? 2

PART-B

1. a) What is Java? Briefly describe about the features (platform independent and portable, Robust and secure) of Java Programming language. $5\frac{2}{3}$
   b) Briefly describe about the features (Compiled, Interpreted, and distributed) of Java programming language. 4
   c) What is the difference between break and continue statement? 2

2. a) What do you mean by Applet? 3
   b) Briefly describe the applet life cycle. $6\frac{2}{3}$
   c) Explain run time errors in Java programming language. 2

3. a) What are the differences between array and vector? $3\frac{2}{3}$
   b) What is exception in Java program? 2
   c) Write a Java program to calculate the area and volume of a room using method overloading; where length, width and height are 10, 5 and 12 meter respectively. 6

4. a) What do you mean by method overloading in Java program? 2
   b) Explain default constructor with example in Java programming language. $5\frac{2}{3}$
   c) Write a Java program to create a file "test.txt" and enter your name and roll into the file. 4

Department of Information and Communication Engineering
Pabna University of Science and Technology

B.Sc. (Engineering) 2nd Year 1st Semester Examination-2017

Session: **2015-2016**

Course Code: **ICE-2105** Course Title: **Discrete Mathematics & Numerical Methods**

NB: 1. Answer any SIX questions (Three from each PART).
2. Figures in the right margin indicate full marks.
3. Parts of the same question should be answered together and in the same sequence.
4. Separate answer script must be used for answering the questions of PART-A and PART-B

Time: 3 Hours **Total Marks: 70**

PART – A

1. a) Define composition of relation with example. 3

b) Given $A = \{1, 2, 3, 4\}$ and $B = \{x, y, z\}$. Let R be the following relation from A to B: $R = \{(1, y), (1, z), (3, y), (4, x), (4, z)\}$ $4\frac{2}{3}$

(i) Determine the matrix of the relation.

(ii) Draw the arrow diagram of R.

(iii) Find the inverse relation R^{-1} of R.

(iv) Determine the domain and range of R.

c) Let $A = \{1, 2, 3\}, B = \{a, b, c\}, and\ C = \{x, y, z\}$. Consider the following relations R and S from A to B and B to C respectively. 4

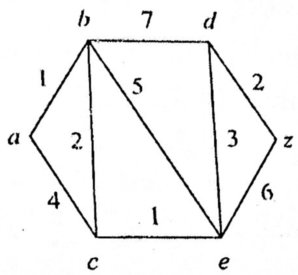
$R = \{(1, b), (2, a), (2, c)\}$ and $S = \{(a, y), (b, x), (c, y), (c, z)\}$

(i) Find the composition relation $R\ o\ S$.

(ii) Find the matrices $M_R, M_S, and\ M_{R\ o\ S}$ of the respective relations R, S and $R\ o\ S$, and compare $M_{R\ o\ S}$ to the product $M_R M_S$.

2. a) Define tautology and contradiction with example. 3

b) Compute the shortest distance between source a and destination z using Dijkstra's algorithm for following graph. $4\frac{2}{3}$



c) Suppose a graph G is input by means of an integer M, representing the vertices $1, 2, \ldots\ldots, M$, and a list N ordered triples (a_i, b_i, w_i) of integers such that (a_i, b_i) is an edge of G and w_i is its weight. Write a procedure for each of the following: 4

(i) To find the $M \times M$ weight matrix of W of the graph G.

(ii) To use (i) and Warshall's algorithm to find the matrix Q of shortest paths between the vertices of G.

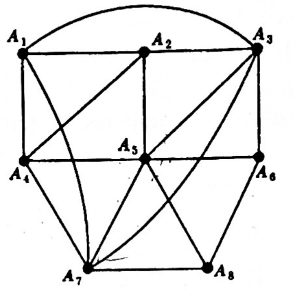
Test the above using the following data:

$M = 4; N = 7;$ (1, 2, 5), (2, 4, 2), (3, 2, 3), (1, 1, 7), (4, 1, 4), (4, 3, 1)

3. a) Describe Hamilton circuit and Eulerian circuit with diagram. 4

b) What is planner graph and graph coloring? 3

c) Using Welch-Powell algorithm find the minimum number C_n of colors required to paint the following graph. $4\frac{2}{3}$



4. a) Define the terms group and semigroup with examples. $3\frac{2}{3}$

b) Prove that every subgroup of a cyclic group G is cyclic. 5

c) Suppose $f: G \rightarrow G'$ is a group homomorphism. 3
Prove: (i) $f(e) = e'$ and (ii) $f(a^{-1}) = f(a)^{-1}$

PART – B

5. a) Evaluate $\Delta^n(e^{ax+b})$, where the interval of differencing being unity. 4

b) What is interpolation and extrapolation? Derive Newton-Gregory forward interpolation formula for equal intervals. $7\frac{2}{3}$

6. a) The area A of a circle of diameter d is given in the following table: 6

d:	80	85	90	95	100
A:	5026	5674	6362	7088	7854

Find approximate areas of circles with diameters 82 and 91 respectively.

b) Fit a parabolic curve to the following data: $5\frac{2}{3}$

x:	1	2	3	4	5
y:	1090	1220	1390	1625	1915

7. a) What is numerical differentiation? Find first and second derivatives of the function tabulated below at the point $x = 1.1$ 6

x:	1	1.2	1.4	1.6	1.8	2.0
$f(x)$:	0	.1280	.5440	1.2960	2.4320	4.00

b) Calculate (upto 4 decimal places) $\int_2^{10} \frac{dx}{1+x}$ by dividing the range into eight equal parts. $5\frac{2}{3}$

8. a) Use Euler's modified method to compute y for $x = 0.05$ and $x = 0.1$. Given that $\frac{dy}{dx} = x + y$, with the initial condition $x_o = 0$, $y_o = 1$. Give the correct result upto four decimal places. $8\frac{2}{3}$

b) Explain Newton-Raphson method for finding the approximate value of the root. 3

Department of Information and Communication Engineering
Pabna University of Science and Technology, Pabna
Faculty of Engineering and Technology
B.Sc. (Engineering) 2nd Year 1st Semester Examination-2017
Session: **2015-2016**
Course Code: **Math-2101** Course Title: **Vector, Matrix and Linear Algebra**

NB:	1. Answer any **SIX**(THREE from each PART) questions. 2. Figures in the right margin indicate marks. 3. Parts of the same question should be answered together and in the same sequence. 4. Separate answer script must be used for answering the questions of PART-A and PART-B

Time: 3 Hours **Total Marks: 70**

PART-A

1. a) Define Vector with examples. Find the projection of the vector $\vec{A} = \hat{\imath} - 2\hat{\jmath} + 3\hat{k}$ on the vector $\vec{B} = \hat{\imath} + 2\hat{\jmath} + 2\hat{k}$. $3\frac{2}{3}$

   b) Determine an unit vector perpendicular to the plane of $\vec{A} = 2\hat{\imath} - 6\hat{\jmath} - 3\hat{k}$ and $\vec{B} = 4\hat{\imath} + 3\hat{\jmath} - \hat{k}$. 4

   c) Prove that $\vec{A} \times (\vec{B} \times \vec{C}) = \vec{B}(\vec{A}.\vec{C}) - \vec{C}(\vec{A}.\vec{B})$. 4

2. a) What do you mean by box product? If $\vec{V} = \vec{w} \times \vec{r}$, prove that $\vec{w} = \frac{1}{2} curl\, \vec{V}$ where $\vec{w}$ is a constant vector. $3\frac{2}{3}$

   b) What do you mean by linearly independence and dependence of a vector? Show that the divergence of the curl of a vector is zero. 4

   c) Define vector differentiation and vector integration. Suppose $\vec{A} = sinu\,\hat{\imath} + cosu\,\hat{\jmath} + u\hat{k}$ and $\vec{B} = cosu\,\hat{\imath} - sinu\,\hat{\jmath} - 3\,\hat{k}$, and $\vec{C} = 2\hat{\imath} + 3\hat{\jmath} - \hat{k}$. Find $\frac{d}{du}\left(\vec{A} \times (\vec{B} \times \vec{C})\right)$ at $u = 0$. 4

3. a) Suppose $\vec{A} = x^2z^2\hat{\imath} - 2y^2z^2\hat{\jmath} + xy^2z\hat{k}$. Find curl $\vec{A}$ at the point (1, -1, 1). 4

   b) Show that $\vec{\nabla} r^n = nr^{n-2}\vec{r}$. $5\frac{2}{3}$

   c) Let $\emptyset = x^2yz - 4xyz^2$. Find the directional derivative of $\emptyset$ at P(1,3,1) in the direction of $2\hat{\imath} - \hat{\jmath} - 2\hat{k}$. 2

4. a) State and prove the Green's theorem in plane. 6

   b) Verify the Green's theorem in the plane for $\oint_C \{(2x - y^3)dx - xy\, dy\}$ where C is the boundary of the region enclosed by the circles $x^2 + y^2 = 1$ and $x^2 + y^2 = 9$. $5\frac{2}{3}$

PART-B

5. a) Define rank of a matrix. Find the rank of the matrix 6

$$A = \begin{bmatrix} 6 & 20 & 4 \\ -2 & -13 & 4 \\ -1 & -16 & 10 \end{bmatrix}$$

   b) Prove that the following system of linear equations is inconsistent: $5\frac{2}{3}$

$$3x_1 + 4x_2 - x_3 + 2x_4 = 1$$
$$x_1 - 2x_2 + 3x_3 + x_4 = 2$$
$$3x_1 + 14x_2 - 11x_3 + x_4 = 3$$

6. a) Define sum and direct sum of two subspaces. Let $V(\mathbb{R})$ be a vector space of $n \times n$ matrices and let S and T are two subspaces of $V(\mathbb{R})$ such that $S = \{A: A' = A\}$ and $T = \{A: A' = -A\}$. Then prove that $V(\mathbb{R}) = S \oplus T$. 4

   b) Define linear combination of vectors. Consider the vectors $v_1 = (2,1,3)$, $v_2 = (1,-1,3)$, and $v_3 = (3,2,5)$ in $\mathbb{R}^3$, then show that $v = (5,9,5)$ is a linear combination of v_1, v_2, v_3. $3\frac{2}{3}$

   c) Define basis and dimension of a vector space. Let $W = L(S)$, where $S = \{(1,-2,5,-3),(2,3,1,-4),(3,8,-3,-5)\}$, is a subset of $\mathbb{R}^4$. Find the basis and dimension of W. 4

7. a) Define Laplace's equation in parabolic cylindrical co-ordinates. $4\frac{2}{3}$

   b) Show that set of vectors $\{(3,0,1,-1),(2,-1,0,1),(1,1,1,-2)\}$ is linearly independent. 7

8. a) Define kernel and range of a linear transformation. 3

   b) Define linear transformation with example. $1\frac{2}{3}$

   c) Show that the following transformation defines a linear operation on $\mathbb{R}^3$: $T(x,y,z) = (x + y, -x - y, z)$. 7

Department of Information and Communication Engineering
Pabna University of Science and Technology
Faculty of Engineering and Technology

B.Sc. (Engineering) 2nd Year 1st Semester Examination-2017

Session: **2015-2016**

Course Code: **STAT-2101** Course Title: **Elementary Statistics and Probability**

NB:	
	1. Answer any **THREE** questions out of **FOUR** from each part (PART-A and PART-B).
	2. Figures in the right margin indicate marks.
	3. Parts of the same question should be answered together and in the same sequence.
	4. Separate answer script must be used for answering the questions of **PART-A** and **PART-B**.

Time: 3 Hours (For PART-A and PART-B) **Total Marks: 35**

PART-A

1. a) Define statistics. Write down the application of statistics in information technology. $3\frac{2}{3}$

   b) What are the types of graphs used in representing frequency distribution? Describe them. 3

   c) In a company having 80 employees, 60 earn \$10.00 per hour and 20 earn \$13.00 per hour. i) Determine the mean earnings per hour. ii) Would the answer in part i) be the same if the 60 employees earn a mean hourly wage of \$10.00 per hour? Prove your answer. 5

2. a) What are the measures of central tendency? Why you study such measures? Which one is the best measure and why? $3\frac{2}{3}$

   b) Table 1.1 shows a frequency distribution of weekly wages of 65 employees at the ABC company. With reference to this table, determine: 8

   i) The percentage of employee earning less than \$280.00 per week.
   ii) The percentage of employee earning less than \$300.00 per week but at least \$260.00 per week.
   iii) A relative-frequency histogram
   iv) A frequency polygon.

Table 1.1

Wages	Number of Employees
\$250.00 –\$259.99	8
\$260.00 –\$269.99	10
\$270.00 –\$279.99	16
\$280.00 –\$289.99	14
\$290.00 –\$299.99	10
\$300.00 –\$309.99	5
\$310.00 –\$319.99	2

3. a) Define mean, median, and mode for grouped and ungrouped data. $3\frac{2}{3}$

   b) The following table gives the daily wages (in rupees) in a certain commercial organization: 4

Daily Wages (TK.):	30 - 35	35 - 45	45- 50	50- 60	60 - 65	65 - 70
No. of Employees	25	35	57	60	23	10

   i) Compute arithmetic mean and median of the distribution.
   ii) Find the range of wages of the central 60% employees.

   c) Write down the properties of a good average. In sum of deviations from arithmetic mean is always zero? 4

4. a) Define Dispersion. Why we study dispersion? $2\frac{2}{3}$

b) Define kurtosis. Explain different types of kurtosis. 4

c) The administrator of Pabna PDC Hospital surveyed the number of days 180 randomly chosen patients stayed in the hospital following an operation. The data are: 5

Hospital Stay in Days	1-5	6-10	11-15	16-20	21-25	26-30
Frequency	22	80	42	21	10	3

i) Calculate first fourth moments about mean.

ii) Also calculate P_{25}, Q_3, and D_6.

PART-B

5. a) Define Probability of an event. Also write down axioms of probability. Show that $P(A^c)=1-P(A)$. $2\frac{2}{3}$

b) An experiment consists of three independent tosses of a fair coin. Let X = The number of heads, Y = The number of head runs, Z = The length of head runs, a head run being as occurrence of at least two heads, its length then being the number of heads occurring together in three tosses of the coin. 4
Find the probability function of i) X, ii) Y, and iii) $X+Y$ and construct probability tables and draw their probability charts.

c) A ball is drawn at random from a box containing 6 red balls, 4 white balls, and 5 blue balls. Determine the probability that the ball drawn is i) red, ii) white, iii) blue, iv) not red, and v) read or white. 5

6. a) Suppose that 15 percent of the population is left-handed. Find the probability that in group of 50 individuals, that there will be i) at most 10 left-handers, ii) at least 5 left-handers, iii) between 3 and 6 left-handers inclusive, and iv) exactly 5 left-handers. $3\frac{2}{3}$

b) State and prove the multiplication law of probability. In a cricket series Bangladesh and India play until one team has won 3 matches. The probability that Bangladesh wins any individual match played against India is 0.4. There is no possibility of a tie. Then 4

i) What is the probability that Bangladesh win first 3 matches?

ii) After 5 matches what is the probability that Bangladesh win the series.

c) Find the probability of getting between 40 and 60 heads inclusive in 100 tosses of a fair coin. 4

7. a) Define a two variable linear regression model. Estimate the parameters of this model by the least squares method. $5\frac{2}{3}$

b) Table 2 shows in inches (in) the respective heights X and Y of a sample of 12 fathers and their oldest sons. 6

i) Find and draw the least-squares regression lines of Y on X.

ii) Find and draw the least-squares regression lines of X on Y.

Table 2

Height X of father (in)	65	63	67	64	68	62	70	66	68	67	69	71
Height Y of son (in)	68	66	68	65	69	66	68	65	71	67	68	70

8. a) Calculate the mean and variance of Binominal distribution. 4

b) Show that total probability is unity for Poisson distribution. $3\frac{2}{3}$

c) Define moment generating function. If X is a continuous random variable with probability density function 4

$$f(x) = \begin{cases} (2x - x), & 0 < x < 1 \\ 0\ , & otherwise \end{cases}$$

Then find the moment generating function.

Department of Information and Communication Engineering
Pabna University of Science and Technology
Faculty of Engineering and Technology

B.Sc. (Engineering) 2nd Year 1st Semester Examination-2018

Session: **2016-2017** Course Code: **ICE-2101** Course Title: **Digital Electronics**

NB:	1. Answer any **<u>SIX</u>(THREE** from each PART) questions. 2. Figures in the right margin indicate marks. 3. Parts of the same question should be answered together and in the same sequence. 4. Separate answer script must be used for answering the questions of **PART-A** and **PART-B.**

Time: 3 Hours **Total Marks: 70**

PART-A

1. a) Define: i) Digital Electronics, ii) Number System, iii) Radix, and iv) Bit. $2\frac{2}{3}$
   b) Compare 1's and 2's complement with examples. 3
   c) Write the steps for performing subtraction with r's and (r-1)'s complements. 4
   d) Using 9's complement, subtract $(52530 - 321)_{10}$. 2

2. a) Explain most common postulates used to formulate various algebraic structures. 5
   b) Prove the following theorems: i) $(x + y)' = x' \cdot y'$ and ii) $(x \cdot y)' = x' + y'$. 4
   c) Express the Boolean function $F(A,B,C,D) = D(A' + B) + B'D + ABC$ in a sum of minterms and $F(x,y,z) = (xy + z)(y + xz)$ in a product of maxterm form. $2\frac{2}{3}$

3. a) Write the necessity of Boolean function simplification. Write some drawbacks of map method. 3
   b) Obtain the simplified expressions in sum of products for the following Boolean functions: 3
   i. $F(x,y,z) = xy + x'y'z' + x'yz'$ ii. $F(A,B,C) = A'B + BC' + B'C'$.
   c) Simplify the following Boolean functions using map methods: $5\frac{2}{3}$
   i. $F(A,B,C) = A'C + A'B + AB'C + BC$ ii. $F(x,y,z) = x'yz + xy'z' + xyz + xyz'$
   iii. $F(w,x,y,z) = \sum(0,1,2,4,5,6,8,9,12,13,14)$.

4. a) What is don't care condition? Why it is used? 3
   b) What is K-map? Why diagonal combinations cannot be combined into K-map groups? $2\frac{2}{3}$
   c) Simplify the following Boolean function in (i) sum of products and (ii) products of sum and also draw the gate implementation of the function 6

$$F(A,B,C,D) = \sum(0,1,3,5,8,11,13).$$

PART-B

5. a) Write the procedure to obtain the output Boolean functions from a logic diagram. Explain with example. 4
   b) From the truth table of full addition design full adder and explain it. 5
   c) Explain Ex-OR and Equivalence functions. $2\frac{2}{3}$

6. a) Design a look-ahead generator to solve propagation delay problem of binary parallel adder. 7
   b) A combinational circuit is defined by the functions: $F_1(A,B,C) = \sum(3,5,6,7)$, $F_2(A,B,C) = \sum(0,2,4,7)$. Implement the circuit with a PLA having three inputs, four product terms, and two outputs. $4\frac{2}{3}$

7. a) Define multiplexer. Implement the Boolean function $F(A,B,C,D) = \sum(0,1,3,4,8,9,15)$ with multiplexer. $3\frac{2}{3}$
   b) Define Sequential Logic. Classify it and define each of them. 2
   c) Draw the logic diagram of Clocked J-K flip-flop. Write the operation of Clocked J-K flip-flop using truth table and also derive characteristics equation. How does it define indeterminate state of RS type? 6

8. a) Define state table and state equation with example. 2
   b) Discuss in brief A/D converter. 4
   c) What is counter? What is the difference between asynchronous counter and synchronous counter? $3\frac{2}{3}$
   d) Differentiate between EPROM and EEPROM. 2

Department of Information and Communication Engineering
Pabna University of Science and Technology, Pabna
Faculty of Engineering and Technology
B.Sc. Engineering 2nd Year 1st Semester Examination-2018
Session: **2016-2017**

Course Code: **ICE-2103** Course Title: **Object Oriented programming**

NB:
1. Answer any **<u>SIX</u>** (THREE from each PART) questions.
2. Figures in the right margin indicate marks.
3. Parts of the same question should be answered together and in the same sequence.
4. Separate answer script must be used for answering the question of **PART-A** and **PART-B**.

***Time:* 3 Hours** **Total Marks: 70**

PART-A

1. a) What is class? Give an example of class. Write down the general form of a class definition. 4
   b) What do you mean by public, private and protected member of a class? 3
   c) Define object. How to declare an object? Write down the comparison between class and object. $4\frac{2}{3}$

2. a) What do you mean by data abstraction and encapsulation? 2
   b) Write down some new operators that introduce in C++ programming language. 4
   c) Briefly describe the different types of inheritance in C++ programming language. $5\frac{2}{3}$

3. a) Define constructors and destructors in C++ programming language. 2
   b) What are the special characteristics of the constructor functions? $4\frac{2}{3}$
   c) Briefly describe the copy constructor with suitable example. 5

4. a) What do you mean by Operator Overloading in C++ programming language? 2
   b) Define encapsulation and polymorphism. 2
   c) Write down two normal uses of void in C++ programming language. 2
   d) Write C++ program to perform addition, subtraction, multiplication and division of two integers. $5\frac{2}{3}$

PART-B

5. a) What do you mean by JVM? 2
   b) Briefly describe the general form of Java program. $4\frac{2}{3}$
   c) Explain run time errors and compile time errors in Java programming language. 5

6. a) What do you mean by Applet? 2
   b) Briefly describe the applet life cycle. 6
   c) Explain class and object in Java programming language. 3

7. a) Define exception handling. Give one example of it. Describe the five keywords that manage Java exception handling. 8
   b) What is file management? What are the two approaches that use to read and write files? How many subclasses used for handling characters in files? What are they? 3

8. a) What do you mean by method overriding in Java program?
   b) Briefly describe the major tasks of input and output stream classes.
   c) Write a Java program to create a file "test.txt" and enter your name and roll into that file.

Department of Information and Communication Engineering
Pabna University of Science and Technology
Faculty of Engineering and Technology
B.Sc. (Engineering) 2nd Year 1st Semester Examination-2018

Course Code: **ICE-2105** Session: **2016-2017**

Course Title: **Discrete Mathematics and Numerical Methods**

NB:
1. Answer any **SIX** (THREE from each PART) questions.
2. Figures in the right margin indicate marks.
3. Parts of the same question should be answered together and in the same sequence.
4. Separate answer script must be used for answering the question of **PART-A** and **PART-B**.

Time: 3 Hours **Total Marks: 70**

PART-A

1. a) Let R be the following relation on $A = \{1, 2, 3, 4\}$

$$R = \{(1,3), (1,4), (3,2), (3,3), (3,4)\}$$ 5

i) Find the matrix M_R of R. ii) Find the domain and range of R.

iii) Find R^{-1}. iv) Draw the directed graph of R.

v) Find the composition relation $R\ o\ R$.

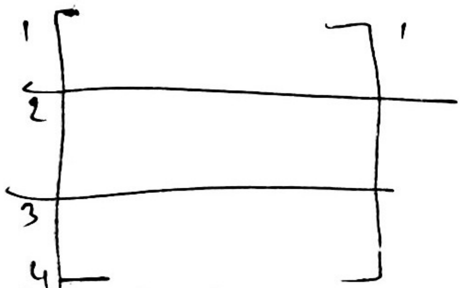
b) Obtain the disjunctive normal form of

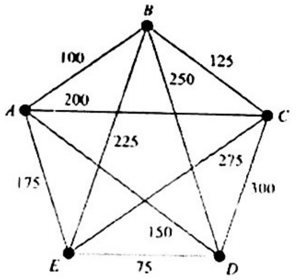
i) $(p \to q) \wedge (\sim p \to q)$ ii) $(p \wedge (p \to q)) \to q$ $6\frac{2}{3}$

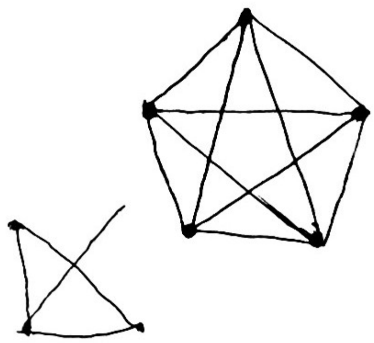
2. a) Draw the graph $K_{2,5}$. 2

b) Show that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$. $4\frac{2}{3}$

c) Apply the nearest-neighbor algorithm to the complete weighted graph G of the following Figure beginning at (i) vertex A, and (ii) vertex D. 5



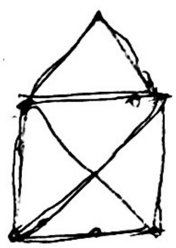


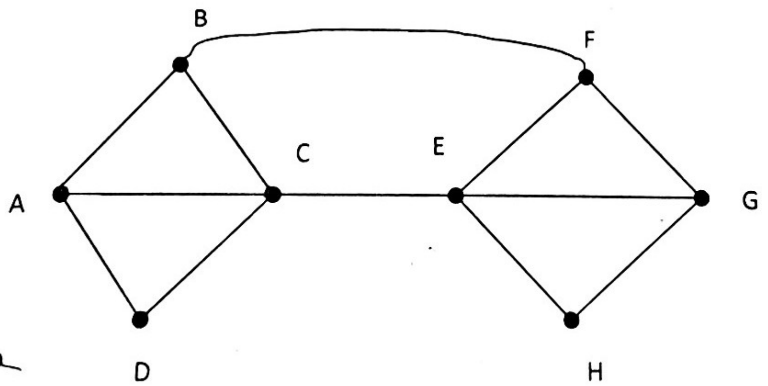


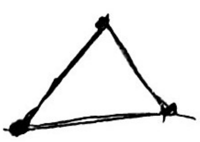
3. a) Define subgraph and quotient graph with examples. 2

b) If G is a connected graph and every vertex has even degree, then show that there is an Euler circuit in G. $4\frac{2}{3}$

c) Use Fleury's algorithm to construct an Euler circuit for the following graph. 5







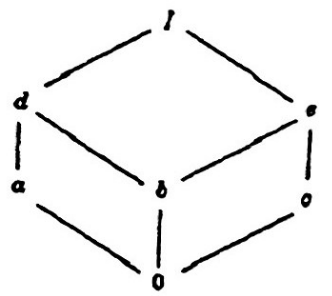
4. a) *Consider the set Q of rational numbers, and let $*$ be the operation on Q defined by $a * b = a + b - ab$* $6\frac{2}{3}$

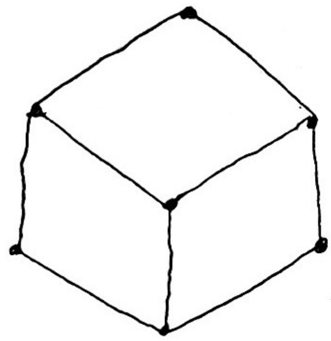
(i) Find $3 * 4$, $2 * (-5)$, and $7 * (1/2)$.

(ii) Is $(\mathbf{Q}, *)$ a semigroup? Is it commutative?

(iii) Find the identity element for $*$.

Consider the lattice L in the following figure





(i) Find all sublattices with five elements.

(ii) Find all join-irreducible elements and atoms.

(iii) Find complements of a and b, if they exist.

(iv) Is L distributive? Complemented?

PART-B

a) Prove that "the nth difference of a polynomial of degree n is constant and higher order differences are zero".

b) The following are the marks obtained by 492 candidates in a certain examinations Find the No. of candidates (i) who secured more than 48 but not more than 50 marks. 5

(ii) less than 48 but not less than 45 marks.

Marks not more than	40	45	50	55	60	65
No. of Candidates	210	253	307	381	413	492

a) Derive Lagrange's Interpolation formula for unequal intervals. 5

b) The following table gives the normal weights of babies during the first 12 months of life: Estimate the weight of the baby at the age of 7 months. $6\frac{2}{3}$

Age in months	0	2	5	8	10	12
Weights in lbs	7.5	10.25	15	16	18	21

a) Derive Gauss's forward interpolation formula for equal intervals. $4\frac{2}{3}$

b) From the following table, find the value of $e^{1.17}$ using Gausses forward formula: 7

x	1.00	1.05	1.10	1.15	1.20	1.25	1.30
e^x	2.7183	2.8577	3.0042	3.1582	3.3201	3.4903	3.6693

a) From the Taylor series for $y(x)$, find $y\ (0.1)$correct to four decimal places if $y(x)$, satisfies $y' = x - y^2$ and y(0)=1. $6\frac{2}{3}$

b) Given, $\frac{dy}{dx} = \frac{y-x}{y+x}$, with $y = 1$ for $x = 0$. Find y approximately for $x = 0.1$ by Euler's method. 5

...na University of Science and Technology ...and Communication Engineering

Faculty of Engineering and Technology

B.Sc. (Engineering) 2nd Year 1st Semester Examination-2018

Session: **2016-2017**

...rse Code: **Stat-2101**

Course Title: **Elementary Statistics and Probability**

NB:
1. Answer any **SIX** (THREE from each PART) questions.
2. Figures in the right margin indicate marks.
3. Parts of the same question should be answered together and in the same sequence.
4. Separate answer script must be used for answering the question of **PART-A** and **PART-B.**

Time: 3 Hours **Total Marks: 70**

PART-A

1. (a) Define frequency distribution, Cumulative frequency curve and ogive. 3 2
   (b) What are different types of graph generally used to represent frequency distribution? Table below shows a frequency distribution of the marks of 100 students. Draw a histogram and frequency polygon from Table-1 and explain them. 6 $\frac{2}{3}$

Table-1

Class interval of marks	Frequency	Class interval of marks	Frequency
25-35	13	55-65	16
35-45	15	65-75	25
45-55	15	75-85	16

   (c) Differentiate between statistics and probability.

2. a) Write different measures of central location? Define weighted arithmetic mean and mode. 2
   b) Prove that the sum of the deviations of set of observation from their arithmetic mean is zero. 3 2
   c) Table-2 shows a frequency distribution of marks obtained of 40 students in Stat-2101. Construct i) a cumulative frequency distribution, ii) a percentage cumulative frequency distribution, iii) an ogive and a percentage ogive. 6 $\frac{2}{3}$

Table-2

Marks obtained	No. of students	Marks obtained	No. of students
40-45	4	61-65	8
46-50	3	66-70	5
51-55	6	71-75	4
56-60	7	76-80	3

(a) Define mean, median and mode for grouped and ungrouped data. 4 $\frac{2}{3}$

(b) The following Table gives the daily wages (in rupees) in a certain commercial organization: 6

Table-3

Daily Wages (Rs.) :	30-32	32-34	34-36	36-38	38-40	40-42	42-44	44-46	46-48	48-50
No. of Workers	2	9	25	30	49	62	39	20	11	3
	2	11	36	66	115	177	216	236	247	250

N=250

Calculate median, third quartile and 8th decile.

(c) Calculate the arithmetic mean of first n natural number 1,2,3,…,n. 1

(d) Explain variance and standard deviation with example. 3

b) Find the mean deviation of heights of 100 students of PUST given in Table-4.

Table-4

Height (inch)	No. of students	Height (inch)	No. of students
60-62	5	69-71	25
63-65	18	72-74	8
66-68	40	75-77	4

c) Define moment and skewness. Prove that

i) $m_2 = m_2' - m_1'^2$ and ii) $m_4 = m_4' - 4m_1'm_3' + 6m_1'^2 m_2' - 3m_1'^4$.

PART-B

5. a) State and explain independent event, dependent event and conditional probability.

b) Three balls are drawn successively from the box containing 6 red balls, 4 white balls, and 5 blue balls. Find the probability that they are drawn in the order red, white, and blue if each ball is i) replaced and ii) not replaced. 4

c) Determine the probability of three 6's in five tosses of a fair die.

6. a) A joint probability density function of two random variables X and Y is given by

$$f(x,y) = 12\,xy\,(1-y); \quad 0<x<1,\ 0<y<1$$

Are X and Y independent?

b) Write down the properties of normal distribution.

c) Let X be a random variable with probability density function $3\frac{2}{3}$

$$f(x) = \begin{cases} 1, & 0 \le x \le 1 \\ 0, & Othewise \end{cases}$$ 4

Find $M_x(t)$ and $E(x)$.

7. a) State and define Poisson distribution.

b) A random variable X has the following probability function: 2

Table-5 $5\frac{2}{3}$

Value of X, x:	1	2	3	4	5	6	7
P(x)	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

i) Find k, ii) Evaluate $P(X<6), P(X\ge 6)$ and $P(0<X<5)$, iii) If $P(X \le k) > 1/2$ find the minimum value of k.

c) What is correlation? Describe different types of correlation.

8. a) What is regression? Differentiate between correlation and regression. 4

b) Construct a straight line that approximates the data of the Table-6. Also find an equation for this line. 3

Table-6 $4\frac{2}{3}$

X	1	3	4	6	8	9	11	14
Y	1	2	4	4	5	7	8	9

c) Fit a least square line data to the data by using i) X as independent variable, ii) X as dependent variable from Table-6. 4

Department of Information and Communication Engineering
Pabna University of Science and Technology
Faculty of Engineering and Technology
B.Sc. (Engineering) 2nd Year 1st Semester Examination-2018
Session:2016-2017

Aziz Sir

Course Code: **Math-2101**

Course Title: **Vector, Matrix and Linear Algebra**

NB:
1. Answer any **SIX** (THREE from each PART) questions.
2. Figures in the right margin indicate marks.
3. Parts of the same question should be answered together and in the same sequence.
4. Separate answer script must be used for answering the question of **PART-A** and **PART-B**.

Time: 3 Hours **Total Marks: 70**

PART-A

1. a) Without making use of the cross product, determine a unit vector perpendicular to the plane of $\vec{A} = 2\hat{\imath} - 6\hat{\jmath} - 3\hat{k}$, and $\vec{B} = 4\hat{\imath} + 3\hat{\jmath} - \hat{k}$. 4

   b) What do you mean by dot product of two vectors? Find the projection of the vectors $\vec{A} = \hat{\imath} - 2\hat{\jmath} + 3\hat{k}$ on the vector $\vec{B} = \hat{\imath} + 2\hat{\jmath} + 2\hat{k}$. $3\frac{2}{3}$

   c) Suppose $\vec{c}_1$ and $\vec{c}_2$ are constant vectors and λ is a constant scalar. Show that $\vec{H} = e^{-\lambda x}(\vec{c}_1 \sin \lambda y + \vec{c}_2 \sin \lambda y)$ satisfies the partial differential equation 4
$$\frac{\partial^2 \vec{H}}{\partial x^2} + \frac{\partial^2 \vec{H}}{\partial y^2} = 0.$$

2. a) Find the unit tangent vector to any point on the curve $x = t^2 + 1,\ y = 4t - 3,\ z = 2t^2 - 6t$. $3\frac{2}{3}$

   b) Find the value of the constants a, b, c so that the vector $\vec{V} = (x + 2y + az)\hat{\imath} + (bx - 3y - z)\hat{\jmath} + (4x + cy + 2z)\hat{k}$ is irrational. 4

   c) Find the directional derivative of $\emptyset = 4xz^3 - 3x^2y^2z$ at (2, -1, 2) in the direction $2\hat{\imath} - 3\hat{\jmath} + 6\hat{k}$. 4

3. a) Show that $\vec{A} = (2x^2 + 8xy^2z)\hat{\imath} + (3x^3y - 3xy)\hat{\jmath} - (4y^2z^2 + 2x^3z)\hat{k}$ is not solenoidal but $\vec{B} = xyz^2\vec{A}$ is solenoid. $4\frac{2}{3}$

   b) Let $\vec{A} = (3x^2 + 6y)\hat{\imath} - 14yz\hat{\jmath} + 20xz^2\hat{k}$. Evaluate $\int_C \vec{A}.d\vec{r}$ from $(0,0,0)$ to $(1,1,1)$ along the straight lines from $(0,0,0)$ to $(1,0,0)$, then to $(1,1,0)$, and then to $(1,1,1)$. 5

   c) Suppose $\vec{A}$ and $\vec{B}$ are irrotational. Prove that $\vec{A} \times \vec{B}$ is solenoidal. 2

4. a) State Green's theorem. Verify Green's theorem in the plane for $\oint_C (xy + y^2)dx + x^2dy$, where c is the closed curve of the region bounded by $y = x$ and $y = x^2$. $6\frac{2}{3}$

   b) Use Divergence theorem to evaluate $\iint_s \vec{F}.\hat{n}\,ds$, where $\vec{F} = 4xz\hat{\imath} - y^2\hat{\jmath} + yz\hat{k}$ and s is the surface of the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$. 5

PART-B

5. a) Define Square matrix, Identity matrix, Diagonal matrix and Scalar matrix with example. 4

   b) Prove that $(AB)^{-1} = b^{-1}A^{-1}$. $2\frac{2}{3}$

   c) What is echelon form of a matrix?Find the echelon form of the matrix 5
$$A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \\ 3 & 2 & 1 \end{pmatrix}$$

6. a) Define inverse of a matrix. Find the inverse of the matrix

$$A = \begin{pmatrix} 1 & 3 & 3 \\ 1 & 3 & 4 \\ 1 & 4 & 4 \end{pmatrix}$$ $6\frac{2}{3}$

b) What do you mean by minor and cofactor of a matrix? Find the rank of the matrix

$$A = \begin{pmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{pmatrix}$$ 5

7. a) Determine the eigen values and the eigen vectors of the matrix

$$B = \begin{pmatrix} 2 & 2 \\ 1 & 3 \end{pmatrix}$$ 5

b) State Cayley-Hamilton theorem. Verify it for

$$A = \begin{pmatrix} 2 & 2 & 3 \\ 1 & -1 & 0 \\ -1 & 2 & 1 \end{pmatrix}$$ $6\frac{2}{3}$

8. a) Solve the following system of equations $5\frac{2}{3}$

$$2x + 4y - z = 9$$
$$3x - y + 5z = 5$$
$$8x + 2y + 9z = 19$$

b) Determine whether or not the vectors $(1, -2, 1)$, $(2, 1, -1)$ and $(7, -4, 1)$ are linearly independent. 3

c) Show that the vectors $(1, 1, 1)$, $(1, 2, 3)$ and $(2, -1, 1)$ are dependent and form a basis of $\mathbb{R}^3$. 3

Department of Information and Communication Engineering
Pabna University of Science and Technology
B.Sc. (Engineering) 2nd Year 1st Semester Examination-2019
Session: 2017-2018 and 2013-2014
Course Code: **ICE-2101 and ICE-2102** Course Title: **Digital Electronics**

NB:	1. Answer any <u>**SIX**</u>(THREE from each PART) questions. 2. Figures in the right margin indicate marks. 3. Parts of the same question should be answered together and in the same sequence.

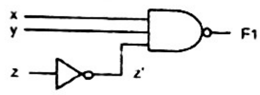
Time: 3 Hours **Total Marks: 70**

PART-A

1. a) Define Digital Electronics. Write the difference between Digital and Analog Electronics. 2
   b) What do you understand by number system? Convert the following numbers: 3
      i) $(764)_8$ to $(\ )_{10}$?
      ii) $(45.6975)_{10}$ to $(\ )_2$?
   c) Write the steps for performing subtraction with (r-1)'s complements. 2
   d) Using 10's complement, subtract $(42530 - 3210)_{10}$. 2
   e) With simple switching circuits demonstrate binary logics. $2\frac{2}{3}$

2. a) Explain two valued Boolean Algebra. Show that Huntington postulates are valid for the set $B = \{0,1\}$ and the two operators $+$, $\cdot$ and NOT. 4
   b) State and explain duality principle with example. 2
   c) Prove the following theorems: i) $(x')' = x$ and ii) $(x \cdot y)' = x' + y'$. 3
   d) Show the procedure of conversion between Canonical Forms with example. $2\frac{2}{3}$

3. a) Draw the output expression for the following logic circuit and simplify it using De-Morgan's theorem. 3



   b) Simplify the following Boolean function using four-variable maps: 5
   $F(A, B, C, D) = \sum(0, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15)$
   c) From the truth table below in Table-1, determine the standard SOP expression. $3\frac{2}{3}$

Input			Output
A	B	C	X
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

Table-1

4. a) Write the rule for obtaining the NOR logic diagrams from Boolean functions. Explain them with simple examples. $2\frac{2}{3}$
   b) Define the terms: i) Fan-out, ii) Power Dissipation, iii) Propagation Delay, and iv) Noise Margin. 3
   c) Simplify the following Boolean function using Tabulation method: 6
   $F = \sum(0,1,2,3,5,7,8,10,12,13,15)$

PART-B

5. a) Write the steps to obtain output Boolean functions from logic diagram. 2

   b) Implement the following functions 4

      i) $F = (A + B')(CD + E)$ with NAND gates only.

      ii) $F = A(B + CD) + BC'$ with NOR gates only.

   c) Design i) 3-bit odd parity generator and ii) 4-bit odd parity checker using exclusive-OR and equivalence functions. 5 $\frac{2}{3}$

6. a) Design an adder that can perform arithmetic addition of two decimal digits in BCD. 8 $\frac{2}{3}$

   b) Define decoder. Implement a full subtractor circuit with a decoder and two OR gates. 3

7. a) Define demultiplexer. Explain 2-to-4 line decoder with enable input. 3 $\frac{2}{3}$

   b) Implement the following function with multiplexer: 3
   $F(A, B, C, D) = \sum (0,3,4,7,8,9,13,14)$.

   c) Define sequential logic. Draw the logic diagram of D flip-flop. Write the operation of D flip-flop using truth table and also derive characteristics equation. 5

8. a) Write the functions of each pin of 555 timer. 3 $\frac{2}{3}$

   b) Design an Astable multivibrator using 555 timer and explain its operation. 5

   c) An Astable 555 multivibrator constructed using the following components, $R_1=1k\Omega$, $R_2=2k\Omega$ and capacitor $C=10\mu F$. Calculate the output frequency from the multivibrator and duty cycle of the output waveform. 3

Pabna University of Science and Technology, Pabna

Department of Information and Communication Engineering

Faculty of Engineering and Technology

B.Sc. (Engineering) 2nd Year 1st Semester Examination-2019

Session: **2017-2018** Course Code: **ICE-2103**

Course Title: **Object Oriented Programming**

NB:	1. Answer any **THREE** questions out of four from each part. 2. Figures in the right margin indicate marks. 3. Parts of the same question should be answered together and in the same sequence. 4. Separate answer script must be used for answering the questions of Part-A and Part-B.

Time: 3 Hours **Total Marks: 70**

Part-A

1. a) What is Object Oriented Programming? Mention different features of Object Oriented Programming Language. 4

   b) What do you understand by data abstraction, encapsulation, polymorphism and dynamic binding? 4

   c) Write a C++ program to display the left triangle using nested for loops. $3\frac{2}{3}$

2. a) Briefly describe the basic data types in C++ programming language. $5\frac{2}{3}$

   b) Write a C++ program to calculate mean, variance and standard deviation of numbers. 6

3. a) Define copy constructor and parameterized constructor in C++ programming language. 3

   b) Briefly describe the different types of inheritance in C++ programming language. $4\frac{2}{3}$

   c) Explain default constructor with suitable example. 4

4. a) What do you mean by dynamic initialization of objects? Why do we need to do this? 3

   b) Write C++ program to perform addition, subtraction, multiplication and division of two integers. $3\frac{2}{3}$

   c) Explain operator overloading in C++ Programming Language with suitable example. 3

   d) What are the advantages of Object Oriented Programming? 2

Part-B

5. a) What is an exception? 2

   b) What is an operator? Briefly explain about the Instance of and dot operator in Java. $4\frac{2}{3}$

   c) How do we define a try block and a catch block? Explain with example. 5

6. a) What is Java method? Give a general syntax of it. How to define a method and describe each part of method header. 5^{2}_{3}

b) Give an example of java program that demonstrate the effect of passing by value. 4

c) Define local variable and variable scope. 2

7. a) What is Java Package? 2

b) Write down the applications of Java Packages. 3

c) Write a Java program to calculate the area and volume of a room using method overloading; where length, width and height are 10, 5 and 12 meter respectively. 4^{2}_{3}

d) What are the differences between method overloading and method overriding in Java? 2

8. a) What are the differences between array and vector? 2

b) How do we add a class or an interface to a Package? Explain. 5^{2}_{3}

c) Write a Java program to create a file "test.txt" and enter your name and roll into the file. 4

Department of Information and Communication Engineering
Pabna University of Science and Technology
B.Sc. (Engineering) 2^{nd} Year 1^{st} Semester Examination-2019
Session: 2017-2018, 2016-2017, 2013-2014 Course Code: ICE-2105
Course Title: Discrete Mathematics and Numerical Methods

NB: 1. Answer any **SIX** questions (Three from each PART).
2. Figures in the right margin indicate full marks.
3. Parts of the same question should be answered together and in the same sequence.
4. Separate answer script must be used for answering the questions of PART-A and PART-B

Time: 3 Hours **Total Marks: 70**

PART – A

1. a) Let R be the relation on **N** defined by the equation $x + 3y = 12$; i.e. $R = \{(x,y) \mid x + 3y = 12\}$. 5

(i) Write R as a set of ordered pairs. (ii) Find the domain and range of R.
(iii) Find R^{-1}. (iv) Find the composition relation RoR.

b) Show equivalence of the following $6\frac{2}{3}$

i) $[d \rightarrow q((\sim a) \wedge b) \wedge c]$ and $\sim[(a \vee (\sim (b \wedge c))) \wedge d]$

ii) $p \wedge (q \wedge r)$ and $(p \vee q) \wedge (p \vee r)$

2. a) A weighted graph G with six vertices, A, B, . . ., F, is stored in memory using a linked representation with a vertex file and an edge file as in the following figure. $6\frac{2}{3}$

(i) List the vertices in the order they appear in memory.
(ii) Find the successor list succ(v) of each vertex v in G.
(iii) Draw a picture of G.

START [7]

Vertex file

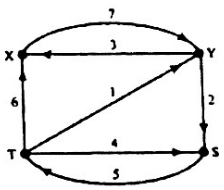
	1	2	3	4	5	6	7	8
VERTEX	*D*		*B*	*F*	*A*		*C*	*E*
NEXT-V	3		8	1	0		4	5
PTR	7		5	9	2		3	0

Edge file

	1	2	3	4	5	6	7	8	9	10	11	12
BEG-V	5	5	7		3	7	1		4	1	4	7
END-V	8	7	5		1	1	5		8	4	3	8
NEXT-E	0	1	12		0	0	10		11	0	0	6
WEIGHT	5	2	1		3	2	4		1	3	4	1

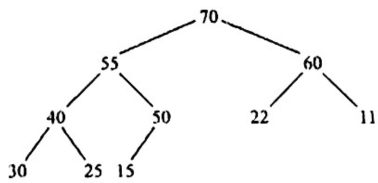
b) Let the G be the weighted graph in the following where the vertices are maintained in memory by the array DATA: X, Y, S, T. 5

(i) Find the weight matrix W of G.
(ii) Find the matrix Q of shortest paths using Warshall's algorithm.

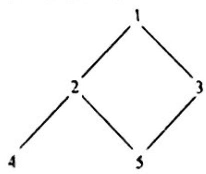


3. a) Suppose the following list of letters is inserted into an empty binary search tree: $3\frac{2}{3}$
J, R, D, G, W, E, M, H, P, A, F, Q
(i) Find the final tree T. (ii) Find the inorder traversal of T.

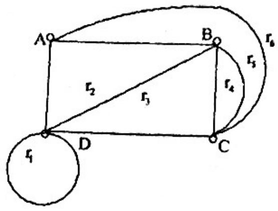
b) Let H be the heap shows in the following figure. Find the final heap H if the numbers 65, 44, and 75 are inserted one after the other into H. 5



c) Let A = {1, 2, 3, 4, 5} be ordered by the Hasse diagram shows in the following figure. Insert the correct symbol, <, ., or _ (not comparable), between each pair of elements: 3
(i) 1 ___ 5; 2 ___ 3; 4 ___ 1; 3 ___ 4.
(ii) Find all minimal and maximal elements of A.

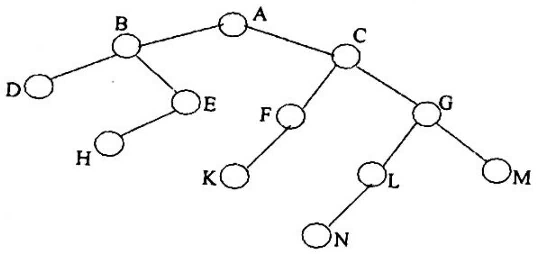


4. a) Draw the Dual Map of the following Map: $2\frac{2}{3}$



b) Broadly describe Breadth-First Search and Depth-First Search algorithm with suitable illustrative example and relative advantages. 3

c) Represent the following binary tree using Linked Representation: 3



d) Describe Isomorphic and Homeomorphic Graph with suitable example. 3

PART - B

5. a) Prove that $E \equiv e^{hD} \equiv 1 + \Delta$ and hence $D = \frac{1}{h}(\Delta - \frac{\Delta^2}{2} + \frac{\Delta^3}{3} - \frac{\Delta^4}{4} + \cdots)$, where D is the differential operator of differential calculus. 5

b) Define interpolation and extrapolation. Derive Newton-Gregory formula for forward interpolation. $6\frac{2}{3}$

6. a) Find a polynomial which takes the following set of values: 5

$(3,6),(5,24),(7,58),(9,108),(11,174)$

b) Using Newton's divided difference formula, find the value of $f(8)$ and $f(15)$ from the following table: $6\frac{2}{3}$

x:	4	5	7	10	11	13
$f(x)$:	48	100	294	900	1210	2028

7. a) What is numerical differentiation and numerical integration? 2

b) Find the first, second and third derivatives of the function tabulated below, at the point x=1.5. $5\frac{2}{3}$

x	:	1.5	2.0	2.5	3.0	3.5	4.0
$y = f(x)$	:	3.375	7.000	13.625	24.000	38.875	59.000

c) Derive a general quadrature formula for equidistant ordinates. 4

8. a) Using Ramanujan's method, find a real root of the equation $6\frac{2}{3}$

$$1 - x + \frac{x^2}{(2!)^2} - \frac{x^3}{(3!)^2} + \frac{x^4}{(4!)^2} - \dots = 0$$

b) Find the root of the equation $x^3 - 2x - 5 = 0$, which lies between 2 and 3 using Muller's method. 5

Department of Information and Communication Engineering
Pabna University of Science and Technology
Faculty of Engineering and Technology
B.Sc. (Engineering) 2nd Year 1st Semester Examination-2019

Course Code: **Math-2101** Course Title: **Vector, Matrix and Linear Algebra**

NB:
1. Answer any **SIX** (THREE from each PART) questions.
2. Figures in the right margin indicate marks.
3. Parts of the same question should be answered together and in the same sequence.
4. Separate answer script must be used for answering the question of **PART-A** and **PART-B**.

Time: 3 Hours **Total Marks: 70**

PART-A

1. a) Define matrix, null matrix, nilpotent matrix and periodic matrix with examples. $3\frac{2}{3}$

   b) Prove the associative law for matrix multiplication. 4

   c) Prove that the matrix which is commutative for matrix multiplication with a diagonal matrix with distinct diagonal elements is diagonal matrix. 4

2. a) Define an idempotent matrix. Show that the matrix $A = \begin{pmatrix} 2 & -3 & -5 \\ -1 & 4 & 5 \\ 1 & -3 & -4 \end{pmatrix}$ is idempotent. $3\frac{2}{3}$

   b) Define an orthogonal matrix, If A and B are orthogonal matrices of order n, then prove that the matrices AB and BA are also orthogonal. 3

   c) Define Hermitian and skew-Hermitian matrices. Show that the diagonal elements of a Hermitian matrix are necessary real but for skew-Hermitian matrix they are either purely imaginary or zero. 5

3. a) Define adjoint and inverse of a matrix. Find the adjoint and inverse of the matrix 6
$$A = \begin{pmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{pmatrix}.$$

   b) Define rank of a matrix. Find the rank of the following matrix using the normal form $5\frac{2}{3}$
$$A = \begin{pmatrix} 0 & 2 & 3 & 4 \\ 2 & 3 & 5 & 4 \\ 4 & 8 & 13 & 12 \end{pmatrix}.$$

4. a) State Cayley-Hamilton theorem. Find the characteristic polynomial $\Delta(t)$ of the matrix $6\frac{2}{3}$
$$A = \begin{pmatrix} 1 & 6 & -2 \\ -3 & 2 & 0 \\ 0 & 3 & 4 \end{pmatrix}.$$

   b) State Stoke's theorem. Verify Stoke's theorem for $\vec{A} = (x - z + 2)\hat{\imath} + (yz + 4)\hat{\jmath} - xz\hat{k}$, where S is the surface for the cube $x = 0, y = 0, z = 0, x = 2, y = 2, z = 2$ above the xy plane. 5

PART-B

5. a) Define subspace of a vector space. Prove that W is a subspace of a vector space V if and only if (i) W is nonempty, (ii) W is closed under vector addition and (iii) W is closed under scalar multiplication. 6

   b) Define linear combinations, linear spans, sum and direct sum. Write the vector $v = (1, -2, 5)$ as a linear combination of the vectors $e_1 = (1, 1, 1), e_2 = (1, 2, 3)$ and $e_3 = (2, -1, 1)$ $5\frac{2}{3}$

6. a) Define vector and scalar with examples. Determine a unit vector perpendicular to the plane of $\vec{A} = 2i - 6j - 3k$ and $\vec{B} = 4i + 3j - k$. 4

   b) Prove that $\vec{A} \times (\vec{B} \times \vec{C}) = \vec{B}(\vec{A}.\vec{C}) - \vec{C}(\vec{A}.\vec{B})$ 3

   c) A particle moves along the curve $x = 2t^2, y = t^2 - 4t, z = -t - 5$, where t is the time. Find the components of its velocity and acceleration at time t =1 in the direction $i - 2j + 2k$. $4\frac{2}{3}$

7. a) Determine whether (1, 1, 1), (1, 2, 3) and (2, -1, 1) are linearly independent. 3

b) Define basis and dimension. Determine whether (1, 1, 1, 1), (1, 2, 3, 2), (2, 5, 6, 4), (2, 6, 8, 5) form a basis of $\mathbb{R}^4$. 4

c) Let $\{(1, 1, 1, 1), (1, 2, 1, 2)\}$ be linearly independent subset of the vector space $\mathbb{R}^4$. Extend it to a basis for $\mathbb{R}^4$. $4\frac{2}{3}$

8. a) State Green's theorem. Verify Green's theorem in the plane for $\oint_C (3x^2 - 8y^2)\,dx + (4y - 6xy)dy$, where C is the boundary of the region defined by $y = \sqrt{x},\ y = x^2$. $5\frac{2}{3}$

b) State Divergence theorem. Verify this theorem for $\vec{A} = 4xi - 2y^2j + z^2k$ taken over the region bounded by $x^2 + y^2 = 4, z = 0$ and $z = 3$. 6

...ent of Information and Communication Engineering
Pabna University of Science and Technology
Faculty of Engineering and Technology
B.Sc. (Engineering) 2nd Year 1st Semester Examination-2019

Course Code: **Stat-2101** Course Title: **Elementary Statistics and Probability**

NB:
1. Answer any **SIX** (THREE from each PART) questions.
2. Figures in the right margin indicate marks.
3. Parts of the same question should be answered together and in the same sequence.
4. Separate answer script must be used for answering the question of **PART-A** and **PART-B**.

Time: 3 Hours **Total Marks: 70**

PART-A

1. a) Define population and sample with example. What do you mean by frequency distribution? Write down the procedure in preparing frequency table. 6
   b) The distribution of amount of import of rice (in 000 M.tons) in different days of a year is shown in Table 1 bellow: $5\frac{2}{3}$

Table 1

Class interval of amount	10-14	14-18	18-22	22-26	26-30
No. of days	5	8	15	18	4

i) Find the number of days of rice import less than 22.
ii) Draw a histogram and frequency polygon on same graph paper

2. a) What do you mean by measures of central tendency? State the properties of arithmetic mean. 3
   b) A series of values with a common ratio r as follows $a, ar, ar^2, ar^3, \dots\dots\dots, ar^{n-1}$.Find arithmetic mean (AM), geometric mean (GM) and harmonic mean (HM) of the series and show that $AM \times HM = GM^2$. 4
   c) The production of defective bulbs in different days in an industry are shown below: $4\frac{2}{3}$

Class interval of defective bulbs	0-5	5-10	10-15	15-20	20-25	Total
No. of days	12	8	16	20	4	60

i) Do you think mean is the best average for this dataset? Explain.
ii) Find mean, median and mode for this dataset.

3. a) Define dispersion. What are the different measures of dispersion? State some properties of standard deviation. 4
   b) Find the variance of first n natural numbers. 3
   c) The grade point average (GPA) in different semesters of two students are shown below: $4\frac{2}{3}$

Student	GPA in semesters							
	1	2	3	4	5	6	7	8
A	2.5	2.5	3.0	3.5	3.5	4.0	3.5	3.5
B	2.5	3.0	4.0	4.0	4.0	2.0	2.5	4.0

Which student would you consider better throughout the courses of studies?

4. a) Define skewness and kurtosis. Discuss different types of skewness and kurtosis. $6\frac{2}{3}$
   b) Prove that the mean deviation and standard deviation calculated from two values x_1 and x_2 of variable x is equal to half of their difference. 5

PART-B

5. a) Explain the concept of probability and discuss its application in ICE. $3\frac{2}{3}$

b) If A and B are two subsets of the Universal set U then prove that $(i)\ (A \cup B)^c = A^c \cap B^c$ and (ii) $A \cup (A^c \cap B) = A \cup (A \cup B^c)^c = A \cup B$ 4

c) Let A, B and C be the events in sample space S defined by $S=\{1,2,3,.....,10\}$, $A=\{3,4,5\}$, $B=\{4,5,6\}$ and $C=\{5,6,8\}$. List the number of the following events: 4

(i) $\left(A^c \cap B^c\right)^c$ and (ii) $\left(A \cap (B \cup C)\right)^c$

6. a) Define conditional probability, prior probabilities and posterior probabilities. 3

b) State and prove Bayes theorem. 4

c) In a bolt factory machine A produces 45% of the output and machine B produces the rest. On the average 9 items in 1000 produced by machine A are defective and 2 items in 500 produced by B are defective. In a day's run, the two machines produce 20,000 items. An item is drawn at random from a day's output and is found to be defective. What is the probability that defective item was produced by machine A? Also calculate the probability that it was produced by machine$B$? Mention the prior and posterior probabilities of the problem. $4\frac{2}{3}$

7. a) What is random variable? Discuss different types of random variable. 4

b) Discuss probability function and probability density function with properties $3\frac{2}{3}$

c) A continuous random variable X has a probability density function$f(x) = 3x^2$; $0 \leq x \leq 1$. Find a and b such that (i) $P[X \leq a] = P[X > a]$, and (ii) $P[X > b] = 0.05$ 4

8. a) Define normal distribution. Write down the properties of normal distribution. $3\frac{2}{3}$

b) Find the mean and variance of the binomial probability distribution. Also show that mean is always greater than variance of the distribution. 4

c) A fair coin is tossed 5 times. Find the probability of (i) exactly two heads, (ii) at least three heads and (iii) at most two heads. 4

Department of Information and Communication Engineering

Pabna University of Science and Technology

Faculty of Engineering and Technology

B.Sc. (Engineering) 2nd Year 1st Semester Examination-2020

Session: **2018-2019, 2017-2018, & 2016-2017**

Course Code: **ICE-2101**

Course Title: **Digital Electronics**

NB:
1. Answer any **SIX** (THREE from each PART) questions.
2. Figures in the right margin indicate marks.
3. Parts of the same question should be answered together and in the same sequence.
4. **Calculator is not allowed in the examination room.**

Time: 3 Hours **Total Marks: 70**

PART-A

1. a) Define the terms: i) Digital Electronics, ii) Binary Logic, and iii) Truth Table. $2\frac{2}{3}$

   b) Explain the term 'number base conversion'. Convert the following numbers: 3

   i) $(106175.001)_8$ to $()_{10}$

   ii) $(12221)_3$ to $()_{10}$ (1160)

   iii) $(41.6875)_{10}$ to $()_2$ (101001.1011)

   c) What do you understand by complement of a number? Describe r's complement with suitable example. 3

   d) Write the steps of subtraction of two positive numbers with (r-1)'s complement. Using 9's complement subtract $(72532 - 3250)_{10}$. 69282 3

2. a) Why NAND gate is said to be a Universal gate? Show that any Boolean function can be implemented with NAND gates. $2\frac{2}{3}$

   b) Prove the following theorems: i) $(x')' = x$, ii) $(x + y)' = x' \cdot y'$, and iii) $x + x \cdot y = x$. 3

   c) Show that Huntington postulates are valid for two-valued Boolean algebra. 4

   d) Draw the 3-input Exclusive-OR gate and write down its truth table. $x'y'z+x'yz'+xy'z'+xyz$ 2

3. a) With example explain Standard and Canonical forms. 4

   b) Write the limitations of map method for minimizing Boolean functions. How it can be solved? 2

   c) Simplify the following Boolean function using map method: 3

   $$F(w,x,y,z) = \sum(0,1,2,4,5,6,8,9,12,13,14)$$

   d) Write the rule for obtaining the NOR logic diagrams from Boolean functions. $2\frac{2}{3}$

4. a) Explain the terms: Don't care condition and Prime implicants. 2

   b) Simplify the following Boolean functions using k-map method: $2\frac{2}{3}$

   $$F(w,x,y,z) = \sum(1,3,7,11,15) \; and \; d(w,x,y,z) = \sum(0,2,5)$$ $w'z+yz$

   c) Write the steps for minimizing Boolean function using Tabulation method. Minimize the following function using Tabulation method $F(w,x,y,z) = \sum(1,4,6,7,8,9,10,11,15)$. 7

PART-B

$x'y'z+w'xz'+wx'+xyz$

5. a) What is a combinational circuit? Write two characteristics of combinational circuits. 3

   b) Design and explain BCD-to-Excess-3 code converter. $4\frac{2}{3}$

   c) Write the steps of obtaining output Boolean functions from a logic diagram. 2

   d) Design 3-bit parity generator and 4-bit parity checker circuits. 2

6. a) Write the problem of binary parallel adder. How it can be solved, explain with suitable diagram. 7

   b) Define Demultiplexer. Design a 4-to-1 line multiplexer. 1 → row~ $4\frac{2}{3}$

7. a) Define the terms: i) sequential circuit, and ii) flip-flop. Write the difference between synchronous and asynchronous sequential circuit. $2\frac{2}{3}$

   b) Explain clocked RS flip-flop from its characteristic table. Also derive its characteristic equation. 5

   c) Write the operation of master-slave flip-flop using suitable diagram. 4

8. a) Define the terms: i) state diagram, ii) state table, and iii) state equation. $1\frac{2}{3}$

   b) What is Synchronous and Asynchronous counter? Design a 3-bit binary counter. 5

   c) Illustrate the principle of Binary Ripple Counter with necessary block diagram. 5

Department of Information and Communication Engineering

Pabna University of Science and Technology

Faculty of Engineering and Technology

B.Sc. (Engineering) 2nd Year 1st Semester Examination-2020

Session: **2018-2019, 2017-2018, & 2016-2017**

Course Code: **ICE-2103**

Course Title: **Object Oriented Programming**

NB: 1. Answer any **SIX** (THREE from each PART) questions.
2. Figures in the right margin indicate marks.
3. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours

Total Marks: 70

PART-A

1. a) Define class, object and method. 3
   b) Differentiate between object oriented programming and procedure oriented programming. 4
   c) Briefly discuss about the basic structure of C++ programming language. $4\frac{2}{3}$

2. a) What is the significance of scope resolution operator (::)? Explain. 3
   b) Mention certain special characteristics of a friend function. 3
   c) Briefly describe the different form of inheritance in C++ programming language. $5\frac{2}{3}$

3. a) What are the purposes of constructor function? How a copy constructor works? 3
   b) What is the wrong of the following fragment? $2\frac{2}{3}$

```
class samp {
  int a;
  public:
    samp(int i)  {a=1;}
      //............. };
int main()
{
  Samp x,y(10);
    //........}
```

   c) Briefly explain what the **overload** keyword does and why it is no longer needed. 3
   d) Give two reasons why you might want to overload a class's constructor. 3

4. a) What do you mean by array of objects? 2
   b) Explain array of objects in C++ programming language with suitable example. $5\frac{2}{3}$
   c) Differentiate between global and local variable. 2
   d) Write down some new operators that introduce in C++ programming language. 2

PART-B

5. a) What do you mean by abstract class and abstract method in java? 2
   b) Briefly discuss about the basic features of Java. $5\frac{2}{3}$
   c) Explain method overriding in java with an example. 4

6. a) What do you mean by JVM? 3
   b) Explain run time and compile time errors in Java programming language. $4\frac{2}{3}$
   c) What are the differences between call by value and call by reference in java? 4

7. a) What is swing in java? 2
   b) Explain java swing class hierarchy diagram. $6\frac{2}{3}$
   c) Write a Java program to calculate the area and volume of a room using method overloading; where length, width and height are 10, 7 and 15 meter respectively. 3

8. a) What is Exception handling? Explain the mechanism of exception handling. 4
   b) What are the advantages of using exception handling? $2\frac{2}{3}$
   c) What is event? Describe the steps of event handling. 5

Department of Information and Communication Engineering

Pabna University of Science and Technology

Faculty of Engineering and Technology

B.Sc. (Engineering) 2nd Year 1st Semester Examination-2020

Session: **2018-2019, 2017-2018, & 2016-2017**

Course Code: **ICE-2105** Course Title: **Discrete Mathematics and Numerical Methods**

NB: 1. Answer any **SIX** (THREE from each PART) questions.
2. Figures in the right margin indicate marks.
3. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours **Total Marks: 70**

PART-A

1. a) Let A = {1, 2, 3}, B = {p, q, r}, and C = {x, y, z}. Consider the following relations R and S from A to B and from B to C, respectively. 5

$R = \{(1, q), (2, p), (2, r)\}$ and $S = \{(p, y), (q, x), (r, y), (r, z)\}$

(i) Find the composition relation $R \circ S$.

(ii) Find the matrices M_R, M_S, and $M_{R \circ S}$ of the respective relations R, S, and $R \circ S$, and compare $M_{R \circ S}$ to the product $M_R M_S$.

b) Show that $6\frac{2}{3}$

(i) the propositions $\neg(p \wedge q)$ and $\neg p \vee \neg q$ are logically equivalent.

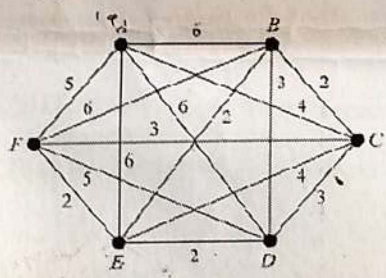
(ii) the following argument is a fallacy: $p \rightarrow q, \neg p \vdash \neg q$.

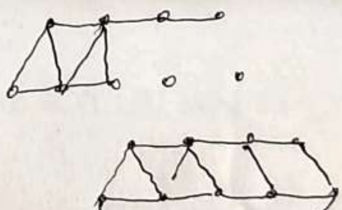
2. a) Draw two 3-regular graphs with: (i) eight vertices; (ii) nine vertices. 3

b) Show that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$. 3

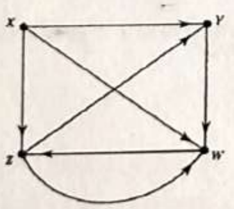
c) Apply the nearest-neighbor algorithm to the complete weighted graph G of the following Figure beginning at (i) vertex A (ii) vertex B. $5\frac{2}{3}$

4+2+2+2+5





3. a) Consider the graph G in the following figure, and suppose the vertices are stored in memory in the array: DATA: X, Y, Z, W $5\frac{2}{3}$



(i) Find the adjacency matrix A of graph G and the powers A^2, A^3, A^4.

(ii) Find the path matrix P of G using the powers of A. Is G strongly connected?

b) A weighted graph G with six vertices, A, B, . . ., F, is stored in memory using a linked representation with a vertex file and an edge file as in the following figure. 6

Vertex file

START 7

	1	2	3	4	5	6	7	8
VERTEX	D		B	F	A		C	E
NEXT-V	3		8	1	0		4	5
PTR	7		5	9	2		3	0

Edge file

	1	2	3	4	5	6	7	8	9	10	11	12
BEG-V	5	5	7		3	7	1		4	1	4	7
END-V	8	7	5		1	1	5		8	4	3	8
NEXT-E	0	1	12		0	0	10		11	0	0	6
WEIGHT	5	2	1		3	2	4		1	3	4	1

(i) List the vertices in the order they appear in memory.

(ii) Find the successor list succ(v) of each vertex v in G.

(iii) Draw a picture of G.

4. a) Draw the ordered rooted tree of the prefix expression + * + - 5 3 2 1 4. Then write this expression using infix notation. $4\frac{2}{3}$

b) Define spanning tree. Find a spanning tree of $K_{4,4}$ and Q_3 graphs. 5

c) Define minimum spanning tree. Write down the Kruskal's algorithm for finding the minimum spanning tree. 2

PART-B

5. a) Prove that "the nth difference of a polynomial of degree n is constant and higher-order differences are zero". 5

b) Define interpolation and extrapolation. Derive Newton-Gregory formula for forward interpolation. $6\frac{2}{3}$

6. a) If $(x) = \frac{1}{x^2}$, find the divided differences $f(a,b)$, $f(a,b,c)$ and $f(a,b,c,d)$. 6

b) For the following table find the form of the function $f(x)$ by Lagrange's formula. $5\frac{2}{3}$

x:	0	1	2	5
$f(x)$:	2	3	12	147

$x^3 - x^2 + 2x - 4$

7. a) Derive the Simpson's 1/3 rule for numerical integration. $5\frac{2}{3}$

b) Calculate an approximate value of $\int_0^{\pi/2} sinxdx$ by the Trapezoidal rule. 6

8. a) Using Ramanujan's method, find a real root of the equation $6\frac{2}{3}$

$$1 - x + \frac{x^2}{(2!)^2} - \frac{x^3}{(3!)^2} + \frac{x^4}{(4!)^2} - \ldots. = 0$$

b) Explain the Newton-Raphson method for finding the approximate value of the root. 5

Department of Information and Communication Engineering

Pabna University of Science and Technology

Faculty of Engineering and Technology

B.Sc. (Engineering) 2nd Year 1st Semester Examination-2020

Session: **2018-2019, 2017-2018, & 2016-2017**

Course Code: **Math-2101**

Course Title: **Vector, Matrix and Linear Algebra**

NB:	
	1. Answer any **SIX** (THREE from each PART) questions. 2. Figures in the right margin indicate marks. 3. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours $\frac{3}{7}\hat{i}-\frac{2}{7}\hat{j}+\frac{6}{7}\hat{k}$ **Total Marks: 70**

PART-A

1. a) Define unit vector. Determine a unit vector perpendicular to the plane of $\vec{A}=2\hat{\imath}-6\hat{\jmath}-3\hat{k}$ and, $\vec{B}=4\hat{\imath}+3\hat{\jmath}-\hat{k}$. 4

   b) What do you mean by dot product of two vectors? Find the projection of the vectors $\vec{A}=\hat{\imath}-2\hat{\jmath}+3\hat{k}$ on the vector $\vec{B}=\hat{\imath}+2\hat{\jmath}+2\hat{k}$. 4

   c) Find the angles which the vector $\vec{A}=3\hat{\imath}-6\hat{\jmath}+2\hat{k}$ makes with the coordinate axes. $3\frac{2}{3}$

2. a) Suppose $\vec{A}=x^2yz\hat{\imath}-2xz^3\hat{\jmath}+xz^2\hat{k}$ and $\vec{B}=2z\hat{\imath}+y\hat{\jmath}-x^2\hat{k}$. Find $\frac{\partial^2}{\partial x\partial y}(\vec{A}\times\vec{B})$. 4

   b) Define irrotational vector. If $curl\,\vec{v}=0$, find the constants a, b and c so that $\vec{v}=(-4x-3y+az)\hat{\imath}+(bx+3y+5z)\hat{\jmath}+(4x+cy+3z)\hat{k}$ is irrotational. 4

   c) Find an equation of the tangent plane to the surface $x^2yz-4xyz^2=6$ at the point $P(1,2,1)$. $3\frac{2}{3}$

3. a) Show that $\vec{A}=(2x^2+8xy^2z)\hat{\imath}+(3x^3y-3xy)\hat{\jmath}-(4y^2z^2+2x^3z)\hat{k}$ is not solenoidal but $\vec{B}=xyz^2\vec{A}$ is solenoid. $4\frac{2}{3}$

   b) Suppose, $\vec{F}=-3x^2\hat{\imath}+5xy\hat{\jmath}$. Evaluate $\int_C \vec{F}.d\vec{r}$ where C is the curve in the xy-plane, $y=2x^2$ from (0,0) to (1,2). 5

   c) Suppose, $\vec{v}=\vec{\omega}\times\vec{r}$. Prove that $\vec{\omega}=\frac{1}{2}curl\vec{v}$, where $\vec{\omega}$ is a constant vector. 2

4. a) Let $\vec{A}=(3x^2+6y)\hat{\imath}-14yz\hat{\jmath}+20xz^2\hat{k}$. Evaluate $\int_C \vec{A}.d\vec{r}$ from $(0,0,0)$ to $(1,1,1)$ along the following path C: 6

   (i) $x=t, y=t^2, z=t^3$.

   $a=4,\ b=\cancel{9}\ -3,\ c=5$

   (ii) The straight line from $(0,0,0)$ to $(1,0,0)$, then to $(1,1,0)$ and then to (1,1,1).

   (iii) The straight line from $(0,0,0)$ to $(1,1,1)$.

   (iv) The straight line joining $(0,0,0)$ to $(1,1,1)$.

   $6\hat{i}+3\hat{j}+14\hat{k}=-6$

   b) State Stoke's theorem, Divergence theorem, and Green's theorem. $5\frac{2}{3}$

PART-B

5. a) Define matrix and order of a matrix. Let $A=\begin{bmatrix}1 & 3\\ 2 & -1\end{bmatrix}$ and $B=\begin{bmatrix}2 & 0 & -4\\ 3 & -2 & 6\end{bmatrix}$. Find: (i) AB and (ii) BA. 6

   b) Define square matrix. If $A=\begin{bmatrix}4 & 6 & 6\\ 1 & 3 & 2\\ -1 & -4 & -3\end{bmatrix}$, prove that $A^3-4A^2-A+4I=0$. $5\frac{2}{3}$

6. a) Show that the matrix $A=\begin{pmatrix}0 & 1\\ 0 & 0\end{pmatrix}$ is nilpotent. 2

   b) If A and B are conformable matrices, then prove that $(A+B)'=A'+B'$. 3

   c) If $A=\begin{pmatrix}1 & 1 & 0\\ 2 & 1 & 3\\ 4 & 1 & 8\end{pmatrix}$ and $B=\begin{pmatrix}4 & 1 & 0\\ 2 & -3 & 1\\ 1 & 1 & -1\end{pmatrix}$, then verify that $(AB)'=B'A'$. $6\frac{2}{3}$

7. a) Define inverse of a matrix. Find the adjoint and inverse of the matrix $6\frac{2}{3}$

$$A = \begin{pmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{pmatrix}.$$

b) What do you mean by normal form of matrix? Reduce the matrix $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 4 & 5 & 6 \end{pmatrix}$ into normal form and hence find its rank. 5

8. a) Solve the following system of equations $5\frac{2}{3}$

$$2x + y - 2z + 3w = 1$$

$$3x + 2y - z + 2w = 4$$

$$3x + 3y + 3z - 3w = 5.$$

b) Determine whether or not the vectors $(1, -2, 1)$, $(2, 1, -1)$ and $(7, -4, 1)$ are linearly independent. 3

c) Show that the vectors $(1, 1, 1)$, $(1, 2, 3)$ and $(2, -1, 1)$ are dependent and form a basis of $\mathbb{R}^3$. 3

$$\begin{bmatrix} -2 & 4/5 & 9/5 \\ 3 & -4/5 & -19/5 \\ -1 & 1/5 & 6/5 \end{bmatrix}$$

Department of Information and Communication Engineering

Pabna University of Science and Technology

Faculty of Engineering and Technology

B.Sc. (Engineering) 2nd Year 1st Semester Examination-2020

Session: **2018-2019, 2017-2018, & 2016-2017**

Course Code: **STAT-2101**

Course Title: **Elementary Statistics and Probability**

NB:
1. Answer any **SIX** (THREE from each PART) questions.
2. Figures in the right margin indicate marks.
3. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours **Total Marks: 70**

PART-A

1. (a) What is measurement scale of data? Discuss about nominal, ordinal, interval scale and ratio scale data. $4\frac{2}{3}$

   (b) Distinguish between primary data and secondary data. 3

   (c) What is frequency distribution? How to construct a frequency distribution? 4

2. (a) Define central tendency. Write down the characteristics of an ideal measure of central tendency. 4

   (b) Suppose the AM and GM of two positive observations are 25 and 15 respectively, find HM. 2

   (c) Compute mean, median, 1st quartile and 3rd quartile from the following data: $5\frac{2}{3}$
   36, 40, 48, 25, 36, 42, 36, and 45.

3. (a) Illustrate the concepts of Skewness and Kurtosis of a distribution. Explain the terms: symmetry, skewed, mesokurtic and platykurtic. 4

   (b) Define raw and central moments of a frequency distribution. Express the second, third and fourth central moments in terms of raw moments. 4

   (c) The first four moments of a distribution about origin are 1.18, 2.76, 8.24 and 29.78. Calculate β_1 and β_2 and comment on the nature of the distribution. $3\frac{2}{3}$

4. (a) Give definition with examples i) Random experiment ii) Events iii) Equally likely events iv) Favorable events. 3

   (b) State and prove additive law of probability for two events, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. 5

   (c) Distinguish between variable and random variable. $3\frac{2}{3}$

PART-B

5. (a) What is conditional Probability? State and prove Bayes theorem. 5

   (b) Suppose the random variable X has pdf as follows: $6\frac{2}{3}$

$$f(x) = \begin{cases} \frac{c}{\sqrt{x}} \; ; & 0 < x < 4 \\ 0 \; ; & otherwise \end{cases}$$

   (i) Determine the value of c. (ii) Evaluate $P(1<X<3)$ (iii) calculate $F(X)$
   (iv) Show that $F(3) - F(1) = P(1 < X < 3)$

6. (a) Define mathematical expectation. How would you compare mathematical expectation with the mean of a frequency distribution? 5

   (b) Let X be a random variable with the following probability mass function: $6\frac{2}{3}$

x	0	1	100	1000
P(X=x)	1/4	1/4	1/4	1/4

   Which is larger $(\sqrt{X})$ *or* $\sqrt{E(X)}$? Compute $E(\sqrt{X})$ *and* $\sqrt{E(X)}$ to check your answer.

7. (a) Define Binomial distribution. Find mean and variance of binomial distribution using moment generating function. 4

(b) Define Poisson distribution. Write down some areas where Poisson distribution is applicable. 4

(c) The number of traffic accidents per week in a small city has a Poisson distribution with mean equal to 2.5. What is the probability of (i) exactly 3 accidents occur in 2 weeks? (ii) not more 2 accidents occur in 2 weeks? $3\frac{2}{3}$

8. (a) Define normal distribution. Draw the shape characteristics of normal distribution. 3

(b) Show that for normal distribution mean, median and mode are identical. $4\frac{2}{3}$

(c) Define conditional probability of an event. A bag contains 7 white, 5 red and 6 black balls. Three balls are drawn at random from this bag without replacement. Find the probability that they are drawn in the order white, red and black. 4

Department of Information and Communication Engineering

Pabna University of Science and Technology

Faculty of Engineering and Technology

B.Sc. (Engineering) 2nd Year 1st Semester Examination-2021

Session: **2019-2020** Course Code: **ICE-2101** Course Title: **Digital Electronics**

NB: 1. Answer any **SIX** (THREE from each PART) questions.
2. Figures in the right margin indicate marks.
3. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours **Total Marks: 70**

PART-A

1. a) Write the advantages and disadvantages of digital electronics over analog electronics. 2

b) Explain the term 'number base conversion'. Convert the following numbers: 3

i) $(101100.001)_2$ to $(\ )_{10}$

ii) $(12121)_3$ to $(\ )_{10}$

c) Write the steps for performing subtraction of two numbers with r's and (r-1)'s complements. 3

d) i) Using 10's complement, subtract $(72532 - 3250)_{10}$. 3.66

ii) Using 2's complement, subtract $(1010100 - 1000100)_2$. Check the answers with straight subtraction.

2. a) Define binary logic and truth table. Find the complements of the following expressions: 3

(i) $xy' + x'y$, (ii) $(A'B + CD)E' + E$, and iii) $(x' + y + z')(x + y')\ (x + z)$

b) Prove the following theorems: i) $(x + y)' = x' \cdot y'$ and ii) $(x \cdot y)' = x' + y'$. 3

c) Show that Huntington postulates are valid for two-valued Boolean algebra. 3

d) Express the Boolean function $F(A, B, C, D) = D(A' + B) + B'D$ in a sum of minterms and $F(x, y, z) = (xy + z)(y + xz)$ in a product of maxterm form. 2.66

3. a) Write the problems of simplifying Boolean expression with algebra. 2

b) Reduce the following Boolean Expressions to the required number of literals using Boolean algebra. 5

i) $ABC + A'B'C + A'BC + ABC' + A'B'C'$ to five literals

ii) $BC + AC' + AB + BCD$ to four literals.

iii) $[(CD)' + A]' + A + CD + AB$ to three literals

c) Write the rules for obtaining the NAND logic diagrams from Boolean functions. 2.66

d) Define map method. Write the procedure for implementing map method. 2

4. a) For the following function: 6

i) Find all the prime implicants

ii) Find all the Essential prime implicants and

iii) Find a simplified expression in Sum of Products using selection rule.

$$F(A, B, C, D) = \Pi M(5, 9, 10, 12, 15) + \sum d(0, 1, 2, 3, 8)$$

b) The number given below is represented in BCD. 3

101110110.01011

Convert the number to hexadecimal (base 16) representation

c) Define binary logic. 2.66

PART-B

5.	a)	What do you mean by Combinational logic? Show that a full-adder can be constructed with two-half adder and an OR gate.	4.66
	b)	Design a BCD-to-Decimal decoder and write the role of don't care condition in this case.	7
6.	a)	Write the difference between Encoder and Decoder.	1.66
	b)	Define Demultiplexer. Design a 2-to-4 line decoder with enable input and explain it.	4
	c)	Implement the following function with a multiplexer: $F(A,B,C,D) = \sum(0,1,3,4,8,9,15)$ and explain it.	4
	d)	Explain Ex-OR and Equivalence functions.	2
7.	a)	Define clocked sequential circuit and flip-flop.	2
	b)	Write the operation of Clocked D flip-flop using truth table and also derive characteristics equation.	4.66
	c)	Draw the logic diagram of Clocked T flip-flop. Write the operation of Clocked T flip-flop from its truth table and also derive characteristics equation.	5
8.	a)	Describe S-R Flip-Flops with diagram and waveform.	6
	b)	Describe the basic operation of the pulse-triggered master-slave flip-flop.	5.66

Department of Information and Communication Engineering
Pabna University of Science and Technology
Faculty of Engineering and Technology
B.Sc. (Engineering)1st year 2nd Semester Examination-2021
Session: **2019-2020, 2018-2019, and 2017-2018**

Course Code: **ICE-2103** Course Title: **Object Oriented Programming**

NB: 1. Answer any **SIX** (THREE from each PART) questions.
2. Figures in the right margin indicate marks.
3. Parts of the same question should be answered together and in the same sequence.

PART-A

1. a) What is an object? What are the characteristics of an object? Define them. 4
   b) What is the difference between object-oriented programming and procedural oriented programming? $3\frac{2}{3}$
   c) What is data binding in C++? Explain late binding and early binding with example. 4

2. a) Mention the basic data types in C++ programming language. 2
   b) Write a C++ program using operator overloading. 4
   c) What is the significance of scope resolution operator? Explain with suitable example. $5\frac{2}{3}$

3. a) Write down the special characteristics of constructor. 3
   b) Briefly discuss about the memory allocation for objects in C++ programming language. $5\frac{2}{3}$
   c) Explain parameterized constructor in C++ programming language. 3

4. a) What is a virtual function? State the application of virtual function. 3
   b) Define array. How a 1D and 2D array can be initialized in C++? Explain with an example. $5\frac{2}{3}$
   c) Differentiate between class and structure. 3

PART-B

5. a) Define string and vector. 2
   b) Explain JVM and type casting in Java. $6\frac{2}{3}$
   c) How Java differs from C and C++? 3

6. a) Write down the name of different primitive data types in Java. 2
   b) What is method overloading? Why is it used in Java? 3
   c) What are conditional operator and bitwise operator? Define them. 4
   d) What is the difference between Container and Component in a GUI? $2\frac{2}{3}$

7. a) Define Local applet and Remote applet. 2
   b) Describe the different stages of an applet life cycle. $6\frac{2}{3}$
   c) Write a Java program using single inheritance. 3

8. a) Why do we require files to store data in Java? 2
   b) Describe the major tasks of input and output stream classes in Java. $6\frac{2}{3}$
   c) Differentiate between sequential file and random access file in Java. 3

Pabna University of Science and Technology

Department of Information and Communication Engineering

Faculty of Engineering and Technology

B.Sc. (Engineering) 2nd Year 1st Semester Examination-2021

Session: 2019-2020

Course Code: **ICE- 2105** Course Title: **Discrete Mathematics and Numerical Methods**

200618

NB: 1. Answer any **SIX** (Three from each PART) questions.
2. Figures in the right margin indicate marks.
3. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours **Total Marks: 70**

PART – A

1. a) Define: reflexive, symmetric and transitive relation with example. 3

b) Let $A = \{1, 2, 3\}$, $B = \{a, b, c\}$, and $C = \{x, y, z\}$. Consider the following relations R and S from A to B and from B to C, respectively. 4.67
$R = \{(1, b), (2, a), (2, c)\}$ and $S = \{(a, y), (b, x), (c, y), (c, z)\}$
Find the matrices M_R, M_S, and $M_{R \circ S}$ of the respective relations R, and S, and compare $R \circ S$, to the product $M_R M_s$

c) Given: $A = \{1, 2, 3, 4\}$. Consider the following relation A: 4

$$R = \{(1, 1), (2, 2), (2, 3), (3, 2), (4, 2), (4,4)\}$$

(i) Draw its directed graph.
(ii) Is R (i) reflexive, (ii) symmetric, (iii) transitive, or (iv) antisymmetric?
(iii) Find $R^2 = R \circ R$.

2. a) State the terms: tautology, contradiction and contingency. 3.67

b) Show that $\neg(p \vee (\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent by developing a series of logical equivalences. 4

c) Let P(x) denote the statement "$x \leq 4$". What are these truth values? (i) P(0), (ii) p(4), and (iii) P(6). 4

3. a) Prove that, a connected graph G with n vertices and $(n - 1)$ edges is a tree. 2

b) Compute the shortest distance between source a and destination z using Dijkstra's algorithm for following graphs Fig. 1. 5

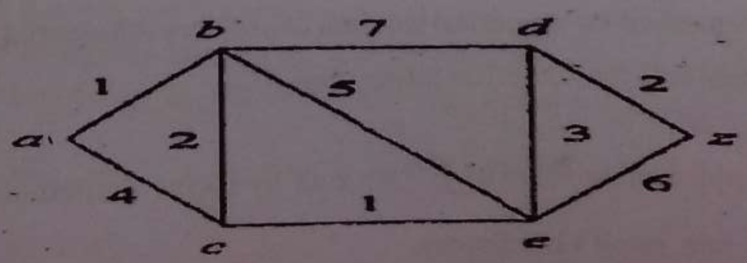


Fig. 1

c) Prove that a simple graph is bipartite if and only if it is possible to assign one of two different colors to each vertex of the graph so that no two adjacent vertices are assigned the same color. 4.67

4. (a) Draw the ordered rooted tree of the prefix expression * / 9 3 + * 2 4 – 7 6. Then write this expression using infix notation. 3.67

b) Find a minimal spanning tree T for the weighted graph G in Fig. 2. 4

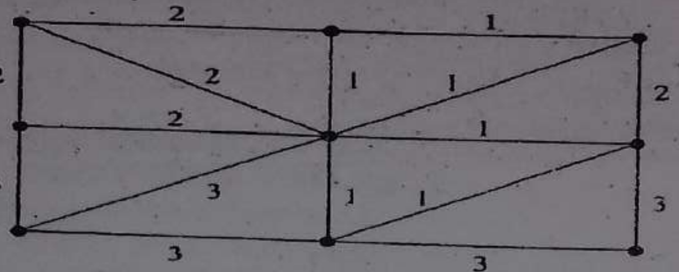
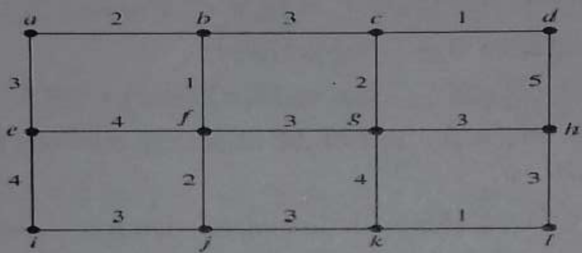


Fig. 2

c) Find a minimum spanning tree of the following weighted graph using Prim's algorithm. 4



PART - B

5. a) Show that $E \equiv e^{\lambda D} \equiv 1 + \Delta$, where D is differential operator of differential calculus. 3

b) Evaluate$\left(\frac{\Delta^2}{E}\right) x^3$. 2

c) Construct a forward difference table for the following values: 6.67

x:	0	5	10	15	20	25
$f(x)$:	7	11	14	18	24	32

6. a) Derive Newton-Gregory formula for backward interpolation. 4

b) Find the lowest degree polynomial which takes the following values: 3.67

x:	0	1	2	3	4	5
$f(x)$:	0	3	8	15	24	35

c) Use Stirling's formula to find y_{35}, given $y_{20} = 512, y_{30} = 439, y_{40} = 346, y_{50} = 243$. 4

7. a) Find the roots of the equation $x \sin x + \cos x = 0$ using Newton-Raphson method. 5

b) Discuss Euler's method for numerical solution of ordinary differential equation. 5

c) State Trapezoidal rule for numerical integration. 1.67

8. a) Calculate an approximate value of $\int_0^{\pi/2} \sin x \, dx$ by (i) the Trapezoidal rule, and (ii) Simpson's "$\frac{1}{3}$" rule, using 11 ordinates. 6.67

(b) Derive the Simpson's three-eight's rule for numerical integration. 5

Department of Information and Communication Engineering

Pabna University of Science and Technology

Faculty of Engineering and Technology

B.Sc. (Engineering) 2nd Year 1st Semester Examination-2021

Session: **2019-2020, 2018-2019, 2017-2018**

Course Code: **Math 2101** Course Title: **Vector, Matrix and Linear Algebra**

NB:	
	1. Answer any **SIX (THREE from each PART)** questions.
	2. Figures in the right margin indicate marks.
	3. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours (For PART-A and PART-B) **Total Marks: 70**

PART A

1. a) What do you mean by cross product of two vectors? Write down the geometrical interpretation of cross product. 6

b) Find the line integral $I = \int (xdy - ydx)$ from (0,0) to (2,2) over the (i) straight line $y = x$; (ii) parabola $y = x^2$. 5.67

2. a) Define vector, gradient, divergence, and curl with examples. 4

b) If $\phi(x, y, z) = 3x^2y - y^3z^2$ find $\nabla\phi$ at the point $(1, -2, -1)$. 2.67

c) If $\boldsymbol{A} = xz^3\boldsymbol{i} - 2x^2yz\,\boldsymbol{j} + 2yz^4\boldsymbol{k}$ find $\nabla \times A$ and $\nabla . A$ at the point $(1, -1, 1)$. 5

3. a) State and prove the Green's theorem in the plane. 5

b) Verify the Green's theorem in the plane for $\int_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where c is the boundary of the region defined by i) $y = \sqrt{x}$ and $y = x^2$; ii) $x = 0$, $y = 0,\ x + y = 1$. 6.67

4. a) State the divergence theorem of Gauss. Evaluate $\iint_s \boldsymbol{F}.\boldsymbol{n}\, ds$,where $\boldsymbol{F} = 6z\hat{\imath} + (2x + y)\hat{\jmath} - x\hat{k}$ and s is the surface of the region bounded by $x^2 + z^2 = 9, x = 0, y = 0, z = 0$, and $y = 8$. 6.67

b) Verify the divergence theorem for $\boldsymbol{A} = (2xy + z)\hat{\imath} + y^2\hat{\jmath} - (x + 3y)\hat{k}$ taken over the region bounded by $2x + 2y + z = 6, x = 0,\ y = 0,\ z = 0$. 5

PART B

5. a) Define symmetric and skew-symmetric matrix with examples. 4

b) Find the inverse of the matrix $A = \begin{pmatrix} 3 & 4 & -1 \\ 1 & 0 & 3 \\ 2 & 5 & -4 \end{pmatrix}$ by using row canonical form. 7.67

6. a) Define the consistent and inconsistent systems of linear equations. Show that following system of liner equations is inconsistent 6

$$x_1 + 2x_2 - 3x_3 = -1;\ 5x_1 + 3x_2 - 4x_3 = 2;\ 3x_1 - x_2 + 2x_3 = 7.$$

b) Determine the value of λ so that the following linear system has (i) a unique solution; (ii) more than one solution; (iii) no solution: 5.67

$$x + y - z = 1; 2x + 3y + \lambda z = 3; x + \lambda y + 3z = 2.$$

7. a) Define Eigenvalues and Eigenvectors of a matrix? 2

b) Find the echelon form and the row reduced echelon form of the following matrix 4.67

$$A = \begin{pmatrix} 1 & 2 & -1 & 2 & 1 \\ 2 & 4 & 1 & -2 & 3 \\ 3 & 6 & 2 & -6 & 5 \end{pmatrix}.$$

c) Determine the rank of the matrix A where 5

$$A = \begin{pmatrix} 2 & 2 & 0 & 4 & 0 & 4 \\ 0 & 2 & 4 & 4 & 0 & 2 \\ 1 & 1 & 6 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -1 & -1 & -2 & 3 & 0 & -2 \end{pmatrix}.$$

8. a) State the Cayley-Hamilton theorem. Using the Cayley-Hamilton theorem find the inverse of the matrix $A = \begin{pmatrix} 1 & 2 & 2 \\ 3 & 1 & 0 \\ 1 & 1 & 1 \end{pmatrix}$. 6

b) Define the rank and nullity of a linear transformation. Let $T: \mathbb{R}^3 \to \mathbb{R}^3$ be the linear operator defined by $T(x, y, z) = (x + 2y, y - z, x + 2z)$. Find the rank and the nullity of T. 5.67

Department of Information and communication Engineering
Pabna University of Science and Technology
Faculty of Engineering and Technology

B.Sc. (Engineering) 2^{nd} Year 1^{st} Semester Final Examination-2021

Session: 2019-2020, 2018-2019, 2017-2018

Course Code: Stat-2101 **Course Title:** Elementary Statistics and Probability

NB:	1. Answer any **<u>SIX</u>** (THREE from each PART) questions.	200618
	2. Figures in the right margin indicate marks.	
	3. Parts of the same question should be answered together and in the same sequence.	

Time: 3:00 Hours **Total Marks: 70**

PART-A

1. a) What do you mean by Statistics? Write some application of Statistics in ICE. $3\frac{2}{3}$

b) What are different scales of measurement? Identify the type and scale of measurement of the following variables: eye colors, weight, expenditure, GRE score, age, sex, economical status, ranking of cricketer, examination grade and temperature. 4

c) Suppose that 35 students are enrolled in a statistics class and the following are the test scores received by them: 4

71, 44, 48, 62, 54, 29, 22, 33, 68, 82, 79, 42, 26, 22, 36, 60, 81, 78, 55, 41, 32, 45, 83, 58, 73, 47, 40, 26, 59, 41, 25, 39, 48, 31, 26

(i) Construct a frequency distribution for the above data.

(ii) Draw a suitable graph to represent the frequency distribution obtained in (i).

2. a) What are the various measures of central tendency? Among them identify the appropriate measures of central tendency for nominal and ordinal data? Which measure of central tendency is applicable at all levels of measurement? Why? 5

b) A series of values with a common ratio r as follows $a, ar, ar^2, ar^3, \dots\dots\dots, ar^{n-1}$. Find arithmetic mean (AM), geometric mean (GM) and harmonic mean (HM) of the series and show that $AM \times HM = GM^2$. 4

c) The run of 9 innings of a batsman are as follows $2\frac{2}{3}$

$$40,10,82,34,36,9,54,76,112$$

Calculate median and 3^{rd} quartile.

3. a) Define dispersion. What are the different measures of dispersion? Among them which is the best measure of dispersion? Why? $4\frac{2}{3}$

b) Find the variance of first n natural numbers. 3

c) The length of 32 leaves were measured correct to the nearest mm are given in the following table: 4

Length	20-22	23-25	26-28	29-31	32-34
Frequency	3	6	12	9	2

Find the mean deviation and standard deviation.

4. a) What do you mean by Skewness and Kurtosis? How do you measure Skewness and Kurtosis? Briefly describe different types of Skewness and Kurtosis. $3\frac{2}{3}$

b) Define the following terms: test of hypothesis, null and alternative hypothesis, power of a test, critical value and test statistic. Distinguish between type I error and type II error. 4

c) What is sampling? What are the methods of sampling? Define probability sampling and nonprobability sampling with example. What are the advantages of sampling over complete enumeration? 4

PART-B

5\. a) Define with example: Random experiment, Sample space, Composite event, Mutually exclusive event. 4

b) Show that probability of an event A lies between 0 and 1. 3

c) A bag contains 4 white, 6 black and 5 green balls. If one ball is drawn at random from the bag, what is the probability that it is (i) black, (ii) white or black, (iii) red? What are the odds in favour of drawing a white ball? $4\frac{2}{3}$

6\. a) What is conditional probability? How does it differ from classical probability? 3

b) State and prove additive law of probability for two non-mutually exclusive events. 4

c) Examination results of 150 students showed that 95 students passed ICE, 75 students passed Statistics and 135 students passed at least one of the above subjects. A student is selected at random. What is the probability that the student (i) passed both ICE and Statistics, (ii) failed both the subjects, (iii) passed ICE but failed Statistics? Also compute if he passed ICE, what is the probability that he passed Statistics? $4\frac{2}{3}$

7\. a) What is random variable? How can you generate a random variable from an experiment of tossing a fair coin three times? 4

b) The probability density function of a random variable x is given below: $7\frac{2}{3}$

$$f(x) = \begin{cases} cx^3 & ; 0 < x < 3 \\ 0 & ; otherwise \end{cases}$$

(i) Determine the value of c.
(ii) Compute $P(1 < x < 2)$ and $P(X > 1)$.
(iii) Calculate $F(2)$.
(iv) Find mean and variance of X.

8\. a) Define binomial experiment and binomial distribution with example. Prove that the mean and variance of a binomial distribution are np and npq respectively. $3\frac{2}{3}$

b) Define Poisson variate and Poisson distribution with example. Write down the characteristics of ~~passion~~ poisson distribution. In a Poisson distribution, $P(x = 2) = P(x = 3)$. Find the value of $P(x \geq 1)$and $P(x \leq 1)$. 4

c) What is normal distribution? Draw the shape characteristics of normal distribution. Under what conditions binomial distribution tends to normal distribution? Prove that the mean and variance of the standard normal variate are 0 and 1 respectively. 4