

**Patuakhali Science and Technology University**

Faculty of Computer Science and Engineering

3<sup>rd</sup> Semester (L-2, S-I) Final Examination of B.Sc. in Engg. (CSE), Jan-June-2022, Session: 2020-21  
Course Code: MAT-211, Course Title: Mathematics-III

Marks-70, Time: 3 hours, Credit: 3.00

[Figure in the right margin indicates full marks. Split answering of any question is not recommended]  
Answer any 05 of the following questions.

1. a) Define order, degree of differential equation and solution of differential equation. 05  
b) Solve the differential equations

(i)  $\frac{dy}{dx} = \frac{y^2+y+1}{x^2+x+1}$  bangla

(ii)  $(x - y)^2 \frac{dy}{dx} = a^2$

(iii)  $\frac{dy}{dx} = (4x + y + 1)^2$

2. a) State the necessary condition for a differential equation  $Mdx + Ndy = 0$  to be exact. 02  
b) Solve the differential equations

(i)  $(1 + e^{\frac{x}{y}})dx + e^{\frac{x}{y}} \left(1 - \frac{x}{y}\right) dy = 0$

(ii)  $(y^4 + 4x^3y + 3x)dx + (x^4 + 4xy^3 + y + 1)dy = 0$

- c) Define Integrating factor. Solve the linear differential equation:  $\frac{dy}{dx} + Py = Q$ , where P and Q are the function of x or constant. 04

3. a) Write some applications of differential equation. 02  
b) Solve the following

(i)  $(D^3 - 13D - 12)y = 0$ .

(ii)  $(D^2 - 2kD + k^2)y = e^x$

- c) Define Clairaut's Equation and solve the differential equation  $(y - px)(p - 1) = p$  04

4. a) Discuss about statistics with its functions and limitations. 03  
b) Write down the name of graphs which are generally used in representing frequency distribution. 02  
c) Establish the relationship among various types of mean. 03  
d) The frequency distribution below gives the cost of production of sugar in different holdings: 06

Cost(Tk.): 10-15, 15-20, 20-25, 25-30, 30-35, 35-40, 40-45, 45-50

No. of Holdings: 11, 27, 42, 45, 35, 30, 20, 15

Compute 3<sup>rd</sup> Quartiles ( $Q_3$ ), 4<sup>th</sup> deciles  $D_4$  and 80<sup>th</sup> percentiles  $P_{80}$ .

5. a) Illustrate some properties of standard deviation with its advantages 04  
b) Discuss about the uses of coefficient of variation 02  
c) Write short notes on Moments, Skewness and Kurtosis 03

- d) A distribution of short term computer credit disbursement from 10 branches of a bank is given below- 05

Amount of credit (Lac Tk.) : 0-5, 5-10, 10-15, 15-20, 20-25

No. of branches : 01 02 04 02 01

Calculate first four central moments, coefficients of skewness and kurtosis and thus comment on the shape and nature of the distribution.

6. a) What are the differences between regression and correlation 03  
 b) Prove that the correlation coefficient is the geometric mean of two regression coefficients 03  
 c) Following marks were obtained out of 100 by 7 students in Physics and Mathematics: 05

Marks in Physics (x):	70	66	68	71	69	65	67
Marks in Mathematics (y):	72	68	69	69	72	67	66

Estimate the least square regression of marks in Mathematics on marks in Physics

- d) Explain the terms: Census, Sample survey and Pilot survey. 03

[Figure in the right margin indicates full marks. Split answering of any question is not recommended]

*Answer any 5 of the following questions*

- 1.** a) Define order, degree of differential equation and ordinary differential equation. LDE., H.D.Eq 05  
 b) Solve the differential equations 2-times 09
- (i)  $(e^y + 1)\cos x dx + e^y \sin x dy = 0$  Exact 5  
 (ii)  $(x - y)^2 \frac{dy}{dx} = a^2$  CN 5  
 (iii)  $\frac{dy}{dx} = (x + y)^2$  variable separable 5  
u
- 2.** a) State the necessary and sufficient condition for a differential equation  $Mdx + Ndy = 0$  to be exact. 02  
 b) Solve the differential equations 08
- (i)  $(1 + e^{\frac{x}{y}})dx + e^{\frac{x}{y}} \left(1 - \frac{x}{y}\right) dy = 0$  Mdx + Ndy  
 (ii)  $(xdx + ydy) = \frac{a^2(xdy - ydx)}{x^2 + y^2}$  CN 3 X
- 3.** Define Integrating factor. Solve the linear differential equation:  $\frac{dy}{dx} + Py = Q$ , where  $P$  and  $Q$  are the function of  $x$  or constant. 04
- a) Write some applications of differential equation. -2, 2, 2 02  
 b) Solve the following 08
- (i)  $D^3 - 2D^2 - 4D + 8 = 0$   ~~$-2 + 4 + 8$~~   ~~$-8 - 8 + 8 + 8 = 0$~~   
 (ii)  $D^2 - 4D + 4 = x^2 + x + 1$   $m = 2, 2$
- 4.** a) Define Clairaut's Equation and solve the differential equation  $(y - px)(p - 1) = p$  page 130, 131 04  
 b) Define frequency distribution and write down the name of graphs that are used to represent the frequency distribution. 03  
 c) The following frequency distribution shows the length of hilsa fish caught on a certain day at a certain point of the Padma: 05  
 Class interval (Length in cm): 25-30, 30-35, 35-40, 40-45, 45-50, 50-55, 55-60  
 No. of fishes caught: 39, 45, 52, 75, 15, 08, 05  
 Draw (i) Histogram and locate the mode and (ii) Frequency polygon by the above distribution.  
 c) The following frequency distribution below gives the cost of production of computers in different brands: 06  
 Cost (Tk. in Lacs): 10-14, 14-18, 18-22, 22-26, 26-30, 30-34, 34-38, 38-42  
 No. of Computers: 11, 27, 42, 45, 50, 55, 65, 70  
 Compute quartiles  $Q_1$ , Deciles  $D_4$  and Percentiles  $P_{80}$
- 5.** a) Illustrate the importance of measuring dispersion. 4th ch. 02  
 b) Calculate the standard deviation and co-efficient of variation from the following frequency distribution: 06  
 Class Interval: 50-60, 60-70, 70-80, 80-90, 90-100, 100-110, 110-120  
 Frequency: 05 09 13 20 19 09 05  $\sqrt{\frac{d}{dx} v} + \sqrt{\frac{d}{dx} u}$

A.6

- c) A distribution of short term computer credit disbursement from 10 branches of a bank is given below-

Amount of credit (Lac Tk.):	0-5,	5-10,	10-15,	15-20,	20-25
No. of branches :	01	02	04	02	01

Find the coefficients of skewness and kurtosis and thus comment on the shape and nature of the distribution.

- a) Discuss about the terms: Event, Sample, Census and Pilot survey.  
b) Establish the relation between correlation coefficient and regression coefficient.  
c) Per week weight (in pounds) of a calf from its birth is given below:

Age in week (x):	01	02	03	04	05	06	07	08	09	10
weight (g):	52.5	58.	65.0	70.2	75.4	81.1	87.2	95.5	102.	108.
	7								2	0

Estimate the least square regression of weight on age and also estimate the weight when the age is 8.5 weeks.

$$x = 8.5$$

1. 11

2.

# Patuakhali Science and Technology University

Faculty of Computer Science and Engineering

3<sup>rd</sup> semester (L-2, S-I) Final Examination of B.Sc. in Engg. (CSE), Jan-June 2020

Session: 2018-19, Course Code: MAT-211, Course Title: Mathematics-III

Marks-70 Time: 3 hours Credit: 3.00

Figure in the right margin indicates full marks. Split answering of any question is not recommended.]

Answer any 5 of the following questions

1. a) Define statistics? Write down some characteristics of statistics.

6

- b) Define ogive and Histogram. Draw the histogram and frequency curves for following data?

5

Monthly income (in thousand Tk)	No of workers	Monthly income (in thousand TK)	No of workers
20-22	9	30-32	85
22-24	34	32-34	60
24-26	45	34-36	41
26-28	90	36-38	30
28-30	110	38-41	12

- c) There are two branches of a company employing 100 and 80 employees respectively. If

3

arithmetic's means of the monthly salaries paid by two branches are Rs. 4570 and Rs. 5890

respectively. Find the Arithmetic's means of the salaries of the employees of the company as

a whole?

2. a) Define variance. Find the standard deviation from the monthly wages of 5 workers working in a company.

5

No of workers	Monthly wages (Rs.)	No of workers	Monthly wages (Rs.)
L	1430	O	1460
M	1440	P	1480
N	1445		

- b) Find the working formula for Variance or Prove  $\sigma^2 = \frac{1}{n} \left\{ \sum x^2 - \frac{(\sum x)^2}{n} \right\}$  ?

6

- c) What is Skewness and Kurtosis?

3

3. a) Define probability. State and prove Bay's law of probability.

5

- b) Find Mean and variance of Poisson Distribution?

6

c) The mean of a binomial distribution is 40 and standard deviation 6 calculate n, p and q.

4. a) Define differential equation and Ordinary differential equation.

i.) Solve the differential equation

i)  $\frac{dy}{dx} = (4x + y + 1)^2$

ii)  $\frac{dy}{dx} + \frac{y^2 + y + 1}{x^2 + x + 1} = 0$

iii)  $\sin^{-1}\left(\frac{dy}{dx}\right) = x + y$

iv)  $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$

5 a) Define Integrating factor.

b) State and prove the necessary and sufficient condition for a differential equation  $Mdx + Ndy = 0$  to be exact.

c) Solve the differential equation

i).  $(x^3 + 3xy^2)dx + (y^3 + 3x^2y)dy = 0$

ii)  $(1 + e^y)\frac{dx}{dx} + e^y\left(1 - \frac{x}{y}\right)\frac{dy}{dy} = 0$

6 a) Define linear differential equations and Homogeneous differential equation.

b) Solve the linear differential equation:  $\frac{dy}{dx} + Py = Q$ , where P and Q are the function of x or constant.

c) Solve the following differential equation

i)  $\frac{dy}{dx} = \frac{y}{x} + \tan \frac{y}{x}$

ii)  $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 0$

[Figure in the right margin indicates full marks. Split answering of any question is not recommended.]

*Answer any 5 of the following questions.*

1. a) Define Ordinary differential equation, Partial differential equation and Homogeneous differential equation. 5
- b) Solve the following differential equation 9
- (i)  $(x^2 + y^2)dx - 2xydy = 0$
- (ii)  $(x + 2y - 3)dx - (2x + y - 3)dy = 0$
- (iii)  $(x^2 + y^2)dx + 2xydy = 0$
- 2 a) State the necessary and sufficient condition for a differential equation  $Mdx + Ndy = 0$  to be exact. 6
- b) Solve the differential equation 8
- (i)  $(x^2 - 2xy + 3y^2)dx + (4y^3 + 6xy - x^2)dy = 0$
- (ii)  $(x - 2e^y)dy + (y + x \sin x)dx = 0$
- 3 a) Define Integrating factor. 2
- b) Solve the linear differential equation:  $\frac{dy}{dx} + Py = Q$ , where  $P$  and  $Q$  are the function of  $x$  or constant 4
- c) Solve the following 8
- (i)  $\frac{dy}{dx} + \frac{2}{x}y = \frac{y^3}{x^3}$
- (ii)  $(D^2 - 4D + 4)y = x^2 + x + 1$
4. a) What do you understand by statistics? Discuss with example its importance. 4
- b) ~~What do you mean by frequency distribution? Distinguish between variable and attribute.~~ 6
- ~~Marks obtained by 50 students of CSE 3<sup>rd</sup> semester in Mathematics are given below:~~
- 46, 38, 26, 51, 32, 41, 56, 33, 49, 10, 68, 34, 24, 35, 39, 50, 15, 40, 37, 21, 38, 43, 31, 29, 19, 44, 32, 55, 11, 34, 40, 36, 36, 39, 27, 44, 48, 19, 15, 36, 45, 48, 38, 19, 52, 22, 33, 39, 49, 45
- Present the data in the form of a frequency table using the class interval of 10 marks.
- c) What are the different methods of data collection? 4

- (5) a) What is central tendency? What are the usual measures of central tendency?  
b) Find out the mean, median and mode from the following data:

80-89	1
70-79	1
60-69	3
50-59	10
40-49	28
30-39	20
20-29	21
10-19	16

- c) What are the various measures of dispersion? Find the standard deviation of the following distribution 6

5-10	5
10-15	12
15-20	19
20-25	21
25-30	18
30-35	15
35-40	7
40-45	5

- (6) a) Explain the idea of correlation and regression. Fit the regression line of Y on X to the following data: 6

X: 10	12	15	22	24	28	32
Y: 207	222	218	228	230	24	235

- b) Discuss the different techniques of sampling. What is pilot survey? 4  
c) What do you understand by the term "test of significance"? What are the different uses of "t" test? 4

**Patuakhali Science and Technology University**

3<sup>rd</sup> semester (L-2, S-I) Final Examination of B.Sc. in Engg. (CSE), Jan-June-2017

Session: 2015-16, Course Code: MAT-211, Course Title: Mathematics-III

Marks-70, Time: 3 hours, Credit: 3.00

[Figure in the right margin indicates full marks. Split answering of any question is not recommended]  
Answer any 5 of the following questions.

- 1.** a) State the order of each differential equation and determine whether the differential equation under consideration is linear or nonlinear 6

(i)  $\frac{d^4y}{dx^4} + 3\left(\frac{d^2y}{dx^2}\right)^3 + 5y = 0$     (ii)  $\frac{d^2y}{dx^2} + x \sin y = 0$     (iii)  $\frac{d^3y}{dx^3} + \frac{dy}{dx} + y \sin x = 0$

- b) Form the differential equation of the following function: 4

$$Ax^2 + By^2 = 1$$

- c) Solve the differential equation  $\sin^{-1}\left(\frac{dy}{dx}\right) = x + y$  4

- 2.** a) Define homogeneous differential equation with example 2

b) Solve the differential equation  $\left(x \sin \frac{y}{x} - y \cos \frac{y}{x}\right)dx + x \cos \frac{y}{x} dy = 0$  5

- c) Explain the integrating factor of a differential equation. 2

- d) Solve the differential equation  $y \log y dx + (x - \log y) dy = 0$  5

- 3.** a) Write down the form of linear differential equation and Bernoulli's equation 2

b) Solve the differential equation  $\frac{dy}{dx} + \frac{1}{x} \sin 2y = x^3 \cos^2 y$  5

- c) Give the definition of auxiliary equation of a differential equation 2

- d) Solve the differential equation  $(D^2 - 2D + 1)y = x \sin x$  5

- 4.** a) Discuss about statistics. Write down the functions of statistics 4

- b) Marks obtained by 3<sup>rd</sup> semester CSE students in Mathematics out of 70 are given below: 5

Marks	No. of students
20-25	05
25-30	10
30-35	15
35-40	20
40-45	08
45-50	04
50-55	02

Present the data by Histogram and frequency curve.

- c) What are the usual measures of central tendency? 2

- d) For two non-zero positive observations, prove that (i)  $A > G > H$  (ii)  $AH = G^2$  where  
A=Arithmetic mean, H=Harmonic mean, G=geometric mean 4

- 5.** a) Write down the various methods of absolute measures of dispersion 3

- b) Prove that the standard deviation is independent of change of origin but not of scale 5

- c) Find out the coefficient of variation from the following frequency distribution 6

Weights	No. of tomato
50-60	5
60-70	9
70-80	13
80-90	20
90-100	19
100-110	9
110-120	5

6. a) Explain the terms skewness and kurtosis. 2

- b) A card is randomly drawn from a well shuffled pack. What is the probability that the card will be either an Ace or the Queen of diamond? 3

- c) Write down some properties of correlation coefficient 3

- d) Per week weight(in pounds) of a calf from its birth is given below: 6

Age in week (x)	1	2	3	4	5	6	7	8	9	10
Weight (g)	52.5	58.7	65.0	70.2	75.4	81.1	87.2	95.5	102.2	108.0

Estimate the least square regression of weight on age and also estimate the weight when the age is 9.5 weeks.

5. a) Write down the various methods of absolute measures of dispersion 3  
 b) Prove that the standard deviation is independent of change of origin but not of scale 5  
 c) Find out the coefficient of variation from the following frequency distribution 6

Weights	No. of tomato
50-60	5
60-70	9
70-80	13
80-90	20
90-100	19
100-110	9
110-120	5

6. a) Explain the terms skewness and kurtosis. 2  
 b) A card is randomly drawn from a well shuffled pack. What is the probability that the card will be either an Ace or the Queen of diamond? 3  
 c) Write down some properties of correlation coefficient 3  
 d) Per week weight(in pounds) of a calf from its birth is given below: 6

Age in week (x)	1	2	3	4	5	6	7	8	9	10
Weight (g)	52.5	58.7	65.0	70.2	75.4	81.1	87.2	95.5	102.2	108.0

Estimate the least square regression of weight on age and also estimate the weight when the age is 9.5 weeks.

Patuakhali Science and Technology University

Mid Exam.-Jan-June 2023, Course Title: Mathematics-III, Marks-15, Time: 50 minutes

- 1 Solve the following differential equation  $(x^2 + 3xy^2)dx - (y^3 + 3x^2y)dy = 0$  7  
2 Establish the relationship among various types of means. 3  
3 The following frequency distribution shows the length of hilsa fish caught on a certain day at a certain point of the Padma: 5

Class interval (Length in cm): 25-30, 30-35, 35-40, 40-45, 45-50, 50-55, 55-60

No. of fishes caught: 39, 45, 52, 75, 15, 08, 05

Compute: (a)  $Q_1$ ,  $D_1$  and  $P_{90}$  (c) Draw a histogram and locate the mode

# MAT-211

Patuakhali Science and Technology University

Mid Exam.-Jan-June 2021, Course Title: Mathematics-III, Marks-15, Time: 40 minutes

- 1 Solve the following differential equation  $(D^2 + 4)y = x^2$  7
- 2 Write down the relation between arithmetic mean, geometric mean and harmonic mean. 2
- 3 The following frequency distribution shows the length of hilsa fish caught on a certain day at a certain point of the Padma: 6

Class interval (Length in cm): 25-30, 30-35, 35-40, 40-45, 45-50, 50-55, 55-60

No. of fishes caught: 39, 45, 52, 75, 15, 08, 05

Compute: (a) Mean (b) Median (c) Draw a histogram and locate the mode

Give the following differential equation  $\frac{dy}{dx} = \frac{y}{x} + \tan \frac{y}{x}$  8

Define Primary and secondary data. What is the difference between population and sample give your own example? 4

What is Rank correlation? prove that Rank correlation coefficient  $r = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$  3

MAT-mid

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Patuakhali Science and Technology University

Mid Exam.-Jan-June 2022, Course Title: Mathematics-III, Marks-15, Time: 40 minutes

- 1 Solve the following differential equation  $(D^3 - 13D - 12)y = 0.$  7  
2 Write down the measures of central tendency. 2  
3 The following frequency distribution below gives the cost of production of computers in different brands: 6

Cost (Tk. in Lacs): 10-14, 14-18, 18-22, 22-26, 26-30, 30-34, 34-38, 38-42

No. of Computers: 11, 27, 42, 45, 50, 55, 65, 70

Compute quartiles  $Q_1$ , Deciles  $D_4$  and Percentiles  $P_{80}$

$$L_m + \frac{N - F_1}{f_1} \times \frac{A(N)}{10}$$