Bangabandhu Sheikh Mujibur Rahman Science & Technology University
Department of Computer Science & Engineering
2nd Year 1st Semester B.Sc. (Eng.) Examination- 2017

Course Title: Matrices and Differential Equations **Course Code: MAT204**
Full Marks: 60 **Time: 03 Hours**

N.B.
1) Answer **SIX** questions, taking any **THREE** from each section.
2) All questions are of equal values.
3) Use separate answer script for each section.

Section-A

1. (a) Define with example: (i) Matrix (ii) Rectangular matrix (iii) Unitary matrix (iv) Diagonal matrix (v) Singular matrix. 5

   (b) Define symmetric and skew-symmetric matrix. Prove that Every square matrix can be uniquely expressed as the sum of a symmetric matrix and a skew-symmetric matrix. 5

2. (a) Define Inverse of a matrix. Show that $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 7 \\ -2 & -4 & -5 \end{bmatrix}$ is the inverse of $\begin{bmatrix} 3 & -2 & -1 \\ -4 & 1 & -1 \\ 2 & 0 & 1 \end{bmatrix}$. 5

   (b) Define idempotent and nilpotent matrix with an example, If A and B are non-singular matrices, then show that $(AB)^{-1} = B^{-1}A^{-1}$. 5

3. (a) Define eigen values and eigen vectors. 4
   (b) Find the Characteristic root of the matrix $A = \begin{bmatrix} 1 & -3 & 3 \\ 3 & -5 & 3 \\ 6 & -6 & 4 \end{bmatrix}$ 6

4. (a) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & 0 \\ 2 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$ 5

   (b) State and prove the Fundamental theorem of matrix. 5

Section-B

5. (a) Define order and degree of differential equations. Find the differential equation of all circles of radius c. 4
   (b) Solve the initial value problem $(y+2)dx + y(x+4)dy = 0$ with $y(-3) = -1$. 3
   (c) Solve the Ordinary Differential Equation, $\frac{dy}{dx} + \frac{y}{x} = x^3$. 3

6. (a) State and prove the necessary condition for an equation to be exact differential equation. 4
   (b) Solve the Ordinary Differential Equation 6
   $$(2xy+1)dx + (x^2+4y)dy = 0$$

7. (a) Solve the equation 5
   $$x^2\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = 0$$
   (b) Solve the initial value problem $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$ subject to $y(0) = 1$ and $y'(0) = 0$. 5

8. (a) Establish the general form of Charpit's method to solve the non-linear partial differential equations of order one. 5
   (b) Solve the differential equation $\frac{d^2y}{dx^2} - y = x^2\cos x$. 5

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Course Title: Industrial Management and Accountancy Course Code: ACC204
Time: 03 Hours Total Marks: 60

N.B:
i) Answer **06 (SIX)** questions taking any **03 (THREE)** from each section.
ii) All Questions are of equal values.
iii) Use separate answer script for each section.

Section -A

1. a) What do you mean by Business? **02**
   b) What are the main functions of any Business? **04**
   c) How can you classify Industry? **04**

2. a) Define Partnership Business According to Partnership Act, 1932 with its Characteristics **05**
   b) Do you support that there are some basic differences between Partnership Business and Joint Hindu Family Business? If yes, What are the differences? **05**

3. a) Briefly describe about the external Business Environment. **05**
   b) Write down about the qualities of a successful businessman. **05**

4. a) What are the features of joint stock company? **05**
   b) How do you compare between private limited company and public limited company? **05**

Section –B

5. a) Discuss about the objectives of Accounting in brief. **05**
   b) Who are the users of Accounting information? **05**

6. Mr. Mizanur Rahman started his own consulting firm, Mizanur's consulting on July1, 2016. The following transactions occurred during the july. **10**

July-1	Mizanur invested tk. 20,000 cash in the business.
July-2	Paid tk. 1,000 for office rent for the month.
July-3	Purchased tk. 800 of supplies on account.
July-5	Paid tk. 200 for advertisement expense.
July-9	Received tk. 3,000 cash for service provided.
July-12	Withdrew 1,000 cash for personal use.
July-15	Paid tk. 3,000 for employee salary.
July-17	Performed tk. 3,500 of services on account.
July-20	Paid for the supplies purchased on account on july-3.
July-23	Received a cash payment of tk. 2,000 for services provided on account on july-17.
July-26	Borrowed tk. 5,000 from the bank on a note payable.
July-29	Purchased office equipment for tk. 2,500 on account.
July-30	Paid tk. 300 for utilities.

Instructions: Prepare a tabular analysis of the transactions.

7. **Mr. Razu** Started a business with investing Tk. 300000 on **March 1**, 2015. Other transactions at the month are listed below: **10**
March 3, Purchased of goods Tk. 55000 from Mr. Rahim where Tk. 35000 has been paid in cash.
March 7, Sold of Goods Tk. 200000 in cash.
March 10, purchased equipment of Tk. 30000.
March 15, Paid employee salaries for Tk. 25000
March 17, Incurred Advertising expenses in Tk. 15000 on account.
March 20, Received Tk. 35000 from Desh Auto Ltd. but services has not been provided.
March 23, Mr. Razu withdraws Tk. 15000 for personal use.
March 25, Paid Tk. 20000 to Mr. Rahim.
March 30, Paid the bill of transaction occurred in January 17.

You are Required to prepare the necessary journal entries.

8. a) What are the advantages of Trial Balance? 03

b) 07

Incepta Pharmaceuticals Limited
December 31, 2016

Serial No.	Accounts Title	Tk.
1.	Cash	1,16,600
2.	Accounts Receivable	1,54,000
3.	Supplies	15,000
4.	Prepaid Rent	28,000
5.	Office Equipment	3,40,000
6.	Accumulated Depreciation- Equipment	80,000
7.	Notes payable	1,10,600
8.	Accounts payable	60,000
9.	Supplies Expense	57,000
10.	Salaries payable	30,000
11.	Capital	2,50,000
12.	Drawing	1,00,000
13.	Service Revenue	8,80,000
14.	Advertising Expense	1,20,000
15.	Interest payable	5,000
16.	Depreciation Expense	40,000
17.	Rent Expense	50,000
18.	Salaries Expense	3,90,000
19.	Interest Expense	5,000

Instruction: Prepare a Trial Balance.

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Course No.: CSE200 **Course Title: Introduction to Digital Electronics**
Full Marks: 60 **Time: 03 hours**
N.B.

i) Answer **SIX** questions, taking any **THREE** from each Section.
ii) All questions are of equal values.
iii) Use separate answer script for each section.

Section-A

1. a) Define digital system with examples. What is Error-Detection Code? How can you detect the errors using Error-Detection Code during transmission? 4
   b) Do the subtraction using 10's complement: 4
      i. $(11001)_2 - (10001)_2$
      ii. $(10001)_2 - (11001)_2$
   c) Define the binary logic. Give the truth table of the binary logic. 2

2. a) Find the complement(F′) of the function F= x′yz′ + x′y′z applying De-Morgan's theorem as many times as necessary and draw the logic diagrams for both functions F and F′. 4
   b) Convert the following expression to Sum-of-Product (SOP) form: 4
      i. (A+B′C) C
      ii. (A+C) (AB+AC)
   c) Express the Boolean function F(A, B, C) = A + B′C in a sum of minterms. 2

3. a) Simplify the Boolean function F(w, x, y, z) = ∑(1, 3, 7, 11, 15) and the don't-care conditions D(w, x, y, z) = ∑(0, 2, 5) using K-map. 4
   b) How many ways can you simplify the Boolean function? Explain with examples. 3
   c) Write down the design procedure of digital logic. 3

4. a) Simplify the Boolean function F= x′yz + x′yz′ + xy′z′ + xy′z using K-map. 4
   b) Design a full adder circuit. 3
   c) What is BCD code? Which of the following BCD codes are forbidden? 3
      1001, 1011, 1010, 0100, 1111, 1101

Section-B

5. a) Draw the electronic circuit diagram of diode logic AND and OR gate with function and truth table. 4
   b) Draw and explain the circuit diagram of a transistor astable multivibrator. 4
   c) Write down the number 0 to 13 using weights 8421. Then make these numbers in even parity. 2

6. a) Draw the electronic circuit diagram of diode-transistor logic (DTL) NAND gate with function and truth table. 4
   b) Sketch the electronic logic circuit for the following Boolean function: 4
      F(A,B,C) = (AB + BC)′
   c) What is propagation delay and noise margin? 2

7. a) What is totem-pole output? Draw the electronic circuit diagram with totem-pole output. 4
   b) Draw the electronic circuit diagram of resistor-transistor logic (RTL) NOR gate with function and truth table. 4
   c) Show the circuit of a two-input NOR gate using MOS transistors. 2

8. a) Compare TTL, ECL and CMOS logic families with respect to propagation delay, speed-power product, fan-out, noise margin and maximum clock rate. 5
   b) How does CMOS internal circuitry differ from N-MOS? 3
   c) What factors determine CMOS fan-out? 2

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Course No.: STA204 **Course Title: Theory of Statistics**
Full Marks: 60 **Time: 03 hours**
N.B.

i) Answer **SIX** questions, taking any **THREE** from each Section.
ii) All questions are of equal values.
iii) Use separate answer script for each section.

Section-A

1. a) Define chi-square variate and chi-square distribution. 2
   b) Write down the applications of chi-square distribution. 3
   c) Find the mean and variance of chi-square distribution. 5

2. a) Define statistic, estimator, unbiased estimator and most efficient estimator. What are the sufficient conditions for consistency? 6
   b) If $X_1, X_2, \dots, X_n$ are random observations on a Bernoulli variate X taking the value 1 with probability p and the value 0 with probability $(1-p)$, show that $\bar{X}$ is a consistent estimator of p. 4

3. a) What is statistical inference? State two important problems in statistical inference. 2
   b) What are the characteristics of a good estimator? State the invariance property of consistent estimator. 2
   c) Suppose that X_1, X_2, and X_3 is a random sample of size 3 from a population with mean μ and variance σ^2. T_1, T_2, and T_3 are the estimators used to estimate mean value μ, where, 6
   $T_1 = X_1 + X_2 - X_3$
   $T_2 = 2X_1 + 3X_3 - 4X_2$ and
   $T_3 = \frac{1}{3}(\lambda X_1 + X_2 + X_3)$
   i. Are T_1 and T_2 unbiased estimators of μ?
   ii. Find the value of λ such that T_3 is unbiased estimator of μ?
   iii. Which is the best estimator?

4. a) Define efficiency and amount of efficiency of an estimator. 2
   b) Let, $X_1, X_2, \dots, X_n$ is a random sample from a normal population $N(\mu, 1)$. Show that $t = \frac{1}{n}\sum_{i=1}^{n} x_i^2$ is an unbiased estimator of $\mu^2 + 1$. 4
   c) Find the maximum likelihood estimator for the parameter λ of a Poisson distribution on the basis of sample size n. Given that the probability mass function of Poisson distribution is - 4

$$f(x) = \frac{e^{-\lambda}\lambda^x}{x!}; \quad x = 0, 1, 2, \dots \dots$$

Section-B

5. a) Define level of significance and power of test. 2
   b) Explain which of the following is a two-tailed test, a left-tailed test, or a right-tailed test. 3
   i. $H_0: \mu = 45,\ H_1: \mu > 45$
   ii. $H_0: \mu = 23,\ H_1: \mu \neq 23$
   iii. $H_0: \mu = 75,\ H_1: \mu < 75$
   Show the rejection and non-rejection regions for each of these cases by drawing a sampling distribution curve for the sample mean, assuming that it is normally distributed.
   c) In Microsoft corporation 100 workers are working, 25 of them are skilled. In another industry say for example IBM, there are 18 skilled workers out of 125 workers. Are the skilled workers similar in both industries?($Z_{0.025} = 1.96$) 5

6. a) A researcher claims that the average wind speed in a certain city is μ_0 miles per hour. A sample of n days has an average wind speed of $\bar{x}$ miles per hour. The known standard deviation of the population is σ_0 mile per hour. At α% level of significance, is there enough evidence to reject the claim? Write the steps of the test. 5

b) The number of computer engineers coming from two different universities A and B ar employed in different organizations to do job related to computer. The numbers are give for different years as follows:

University A:	18	16	15	20	18	15	12				
University B:	20	14	12	22	16	14	15	10	12	18	10

Assume that variances of number of graduates employed in computer related job are 7 an 16 respectively for university A and B. Do you think employment facility for both th universities are similar? ($Z_{0.025} = 1.96$)

7. a) Discuss the tests of regression coefficient and correlation coefficient.
   b) The following are the heights (x in mm) and weights (y in gm) of some animals

Height (x):	155	158	155	152	159	158	154	154	152	154
Weights (y):	65	62	56	56	60	58	58	55	56	60

   i. Is the weight of animals significantly increased due to the increase in height?
   ii. Test the significance of correlation of height and weight.($t_{0.05,\ 8} = 2.302$)

8. a) How do you test the significance of a sample regression coefficient?
   b) What is non-parametric test? What are the advantages and disadvantages of non-parametric test?
   c) Describe two sample sign test.