Department of Computer Science and Engineering
University of Rajshahi
B.Sc. Engineering Part II-Odd Semester, 2021
Course: STAT-2111 (Statistics for Engineers) JF

Marks: 7.5 Time: 45 mins

[N.B. All questions are of equal value. Answer any one question]

1. (a) What do you mean by (i) manifold classification and (ii) contingency table? What are the uses of contingency table? 1.5

(b) Construct chi-square value for 2x2 contingency with cell frequencies u, v, x and y respectively. What happen if you apply Fisher exact correction? 3

(c) In the contingency table below, the two categorical variables are gender and ice cream flavor preference. This is a two-way table (2 X 3) where each cell represents the number of times males and females prefer a particular ice cream flavor. 3

Gender	Chocolate	Strawberry	Vanilla	Total
Female	37	17	12	66
Male	21	18	32	71
Total	58	35	44	137

Is there any relationship between gender and flavor preference?
(Chi-square value at $\alpha = 0.05$ is 3.99)

2. (a) Define with example (i) critical value and critical region, (ii) null and alternative hypotheses and (ii) Type-I and Type-II error. 1.5

(b) What is power of a test? Explain the different steps to construct statistical test of hypothesis. 2.5

(c) Suppose a baker claims that his bread height is more than 15 cm, on the average. Several of his customers do not believe him. To persuade his customers that he is right, the baker decides to do a hypothesis test. He bakes 10 loaves of bread. The average height of the sample loaves is 17 cm. The baker knows from baking hundreds of loaves of bread that the standard deviation for the height is 0.5 cm. 3.5

Assignment

1. If $f(x,\lambda) = \lambda e^{-\lambda x}$, $0 < x < \infty$

Find MLE of λ

2. If $f(x,\theta) = \frac{1}{\theta} e^{-\frac{x}{\theta}}$ $\theta > 0$, $x > 0$

Find MLE of θ

3. If $f(x,\theta) = e^{-(x-\theta)}$, $x > 0$, $-\infty < \theta < \infty$

Find sufficient statistic for θ.

4. $f(x,\theta) = \theta x^{\theta-1}$ $0 < x < 1$, $\theta > 0$

Show that $t_1 = \prod_{i=1}^{n} x_i$, is sufficient for θ.

5. $P(X = x) = f(x,\lambda) = \frac{e^{-\lambda}\lambda^x}{x!}$: $x = 0,1,2,\cdots$

(i) Find MLE of λ. Also find its variance.

(ii) Show that the sample mean $\bar{x}$, is sufficient for estimatin
the parameter λ of the poisson distribution.

6. Find MLE of θ in the following cases:

(i) $f(x,\theta) = {}^{n}C_x \theta^x (1-\theta)^{n-x}$; $x = 0,1,2,\cdots,n$.

7. Find MLE of θ for a r.s. of size n from the dis

$$f(x,\theta) = \begin{cases} (\theta+1)x^{\theta} & ; 0 \le x \le 1,\ \theta > -1 \\ 0 & , \text{ otherwise} \end{cases}$$

Show that it is also sufficient statistic for θ.

(1) Solve

$(D^2-2D-3)y = 2e^x - 10\cos 5x$ [by operator method]

or, $(D^2+4D+1)y = \sin 2x$

(2) $(D^2+4)y = x^2 e^{2x}$

or, $(D^2+y)y = \cos^2 x$

(3) Find singular soln ~~xep~~

$xp^2 - 2yp + 4x = 0$

or, $y + px = p^2x^4$

(4) $p\cos(x+y) + q\sin(x-y) = z$ by Lagrange Method.

(5) Solve

$\frac{d^2y}{dx} + x\frac{dy}{dx} + (x^2+2)y = 0$ in power of x about $x_0 = 0$

or, $(D^2+xD+1)y = 0$ by series method.

(6) Write down Helmholtz's equation and solve it.

Solve

① (a) Define DE, order, degree with examples. Form DE of all parabolas whose axis is the axis of

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

(c) $\cos(x+y)dy = dx$

2. Solve DE

(a) $x\frac{dy}{dx} + x + y = 0$

(b) $x\frac{dy}{dx} + y = y^2 \log x$

(c) $\frac{dy}{dx} + \frac{y}{x}\log y = \frac{y}{x}(\log y)^2$

0 ⟶ 1(a), 2(a)

1 ⟶ 1(b) 2(b)

2 ⟶ 1(c), 2(c)

7(a) Solve $\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2+2)y = 0$ in powers of x about $x_0 = 0$.

OR

8 Write down Helmholtz's equation and solve it.

Solve

2(a) $(D^2+D+1)y = 0$ by series method and test its convergency.

Answer any (3)

1(a) Solve $(D^2-2D-3)y = 2e^x - 10\cos x$ (ope

OR

1(b) $(D^2+4D+1)y = \sin 2x$ (operator)

2(a) $(D^2+4)y = x^2e^{2x}$

OR

2(b) $(D^2+4)y = \cos^2 x$

5 Find Singular Soln $xp^2 - 2y + 4$

6 $p\cos(x+y) + q\sin(x-y) = z$ by Lagran

Course-CSE-2131(Discrete Mathematics)

Class Test- 02

Time: 1 hour, Full Mark: 15

1. (a) Define relation with example.

(b) Let R be the relation represented by the matrix

$$M_R = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$$

Find the matrix representing

a) R^{-1} *b)* $\bar{R}$ *c)* R^2

2. Define poset. Draw the Hasse diagram for the poset $(\{2, 4, 5, 10, 12, 20, 25\}, |)$ and find the maximal and minimal elements of the poset. Here '|' means 'divides' relation.

3. Use Warshall's Algorithm to find the transitive closures of the relation $R = \{(1,2), (1,3), (1,4), (2,3), (2,4), (3,4)\}$ on $\{1,2,3,4\}$

B.Sc (engg.) 2nd year 1st semester 2021

Class Test 01

Course: Discrete Mathematics

Time: 45 minutes Full Marks: 10

. Define tautologies, contradictions, and contingency with examples.

. Determine whether $(\neg q \wedge (p \rightarrow q)) \rightarrow \neg p$ is a tautology.

. What is the contra positive, the converse and the inverse of the following conditional statement? "If you work hard then you will be rewarded".

. Let p and q be the propositions

p : It is below freezing. q : It is snowing.

Write these propositions using p and q and logical connectives (including negations).

a) Either it is below freezing, or it is snowing, but it is not snowing if it is below freezing.

b) That it is below freezing is necessary and sufficient for it to be snowing.

. Let p, q, and r be the propositions

p : You have the flu. q : You miss the final examination. r : You pass the course.

Express each of these propositions as an English sentence.

a) $(p \rightarrow \neg r) \vee (q \rightarrow \neg r)$

b) $(p \wedge q) \vee (\neg q \wedge r)$

1. Write Verilog HDL code to implement a 3-to-8 Line Decoder with Enable signal.

2. Draw the timing diagram of the following simulate module.

```
module comb_circuit(a, b, c, d);
input a, b, c;
output d;
xor   #5 xr (t,a,b);
xnor  #5 xnr(d,t,c);
endmodule
```

```
module simulate;
reg  A, B, C;
wire D;
comb_circuit ct(A, B, C, D);
initial
begin
      A = 1'b0; B = 1'b0; C = 1'b1;
#20   A = 1'b1; C = 1'b0;
#20   B = 1'b1; C = 1'b1;
#20   A = 1'b0;
end
endmodule
```

1. Write Verilog HDL code to implement a 8-to-1 Line Multiplexer.

2. Draw the timing diagram of the following simulate module.

```
module comb_circuit(a, b, c, d);
input a, b, c;
output d;
xnor #5 xnr(t,a,b);
xor  #5 xr (d,t,c);
endmodule
```

```
module simulate;
reg  A, B, C;
wire D;
comb_circuit ct(A, B, C, D);
initial
begin
      A = 1'b1; B = 1'b1; C = 1'b1;
#20   A = 1'b0; C = 1'b0;
#20   B = 1'b0; C = 1'b1;
#20   A = 1'b1;
end
```

8 Design a sychronous couter for counting following 4-bit binary sequence using T FF or JK FF

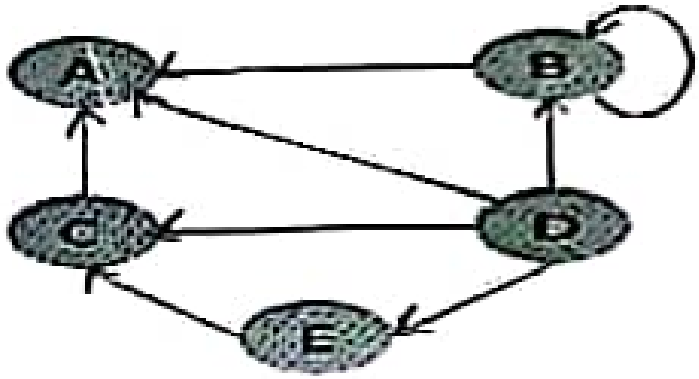
30 min

1001 → 0110 → 1110 → 0111

↑

0101 ← 1010 ← 1100 ← 0011

Consider the following directed graph in the figure below: draw the adjacency matrix and calculate B_1 and from that calculate Path Matrix and tell whether the matrix is strongly connected or not. 7.5



Class Test 01

SET A, Full Marks 7.5, Time: 30 Minutes

1. Simulate the binary search algorithm on the following data: 8 10 12 34 56 78 89 90 100 103 (Search Item is 34). 3
2. For column major order find out the address of the element score [10, 3] from a 20X5 matrix array score with base value 100 and w=4. 1.5
3. Convert the following infix expression to its equivalent prefix and postfix expression: 3

   A + (B * C - (D / E ↑ F) * G) * H

University of Rajshahi
Computer Science and Engineering
Course: ACCO-2111 (Industrial Management and Accountancy)

CT-2

1. a) On September 1, 2020 Mr. Rahman established a Service providing company. The following transactions were completed during the month.

Sep 1, Invested cash to start the company Tk. 50,000;
Sep 3, Paid cash for office rent Tk. 6000;
Sep 8, Purchased office equipment for Tk. 20,000 cash and Tk. 5000 on account;
Sep 15, Paid cash for office supplies Tk. 3000;
Sep 20, Service performed for cash Tk. 28,000 and on account Tk. 7000;
Sep 27, Received Tk. 7000 for service performed on account;
Sep 30 Paid salary Tk. 8000.

Required:

(a) Prepare journal entries to record the above transaction. 3
(b) Post the journal entries to the accounts in the ledger (Use T account) 3.75
(c) Prepare Trial Balance 2

2. a) What is break-even point? 1

b) Padma Company Limited produces a product selling at Tk. 30 per unit. Variable cost per unit is Tk. 18. Annual fixed cost is Tk. 1,50,000. Estimated sales for the period are 20,000 units. 7.75

Required:

i. The break-even point in units and taka;
ii. The contribution margin and contribution margin ratio;
iii. The margin of safety;
iv. The estimated profit for the period;
v. The sales volume in units, if the company wants to earn profit of Tk. 1,20,000.

1. Define business. What are the basic elements of business?
2. What is industry? Discuss, in brief, the different categories of secondary industry.
3. How can commerce help to eliminate the barriers for performing business properly in Bangladesh?
4. What are the factors that should be considered for starting a business?
5. Describe, in brief, the functions of business organization.