**Salahaddin University** **Probability and statistics II**
**College of Education** **Stage : Second class**
**Mathematics Department** **Time : 75 minutes**
**Midterm Examination** **Date : 12 / 04 / 2022**

---

**Q1/** Define joint mgf.

If the random variables X and Y have the joint pdf

$f(x,y) = \begin{cases} e^{-y} & ; \ 0 < x < y < \infty \\ 0 & elsewhere \end{cases}$ , then

**1)** Show that $mgf = \frac{1}{[(1-t_1-t_2)(1-t_2)]}$ provided that $t_1 + t_2 < 1$ and $t_2 < 1$.

**2)** Are X any Y independent? **3)** Find $Cov(x,y)$. (12 marks)

**Q2/** A number $X$ is picked uniformly at random from 1 to 100. Find a formula for the probability mas

function of $X$. What is the expected value of $X^2$? (8 marks)

**Q3)** Consider two random variables X and Y with joint pmf given in the table.

| | Y=0 | Y=1 | Y=2 |
|---|---|---|---|
| X=0 | 1/6 | ¼ | 1/8 |
| X=1 | 1/8 | 1/6 | 1/6 |

a. Find $P(X = 0, Y \leq 1)$.

**b.** Find the marginal pdfs of X and Y.

**c.** Find $P(Y = 1|X = 0)$.

---

**College of Education** **Mathematics Department** **Probability and statistics I**

**Midterm exam** **2nd class-First semester** **Date: 10 /11 / 2021** **Time: 70 minutes**

---

**Q1// A)** Complete the following frequency distribution table: - (12 Marks)

| Classes | Class mark $(x_i)$ | frequency $(f_i)$ |
|---|---|---|
| 10 --- | 13 | 2 |
| | | 4 |
| | | 1 |
| | | 5 |
| | | 6 |
| | | 2 |

Then find: 1) Mean Deviation 2) Median 3) Relative frequency
4) The coefficient of skewness 5) Draw the histogram for the data.

**B)** If numbers of $x_1, x_2, \dots, x_n$ have deviations from any number $k$ given respectively $y_1 = x_1 - k, y_2 = x_2 - k, \dots, y_n = x_n - k$, then prove that $\bar{Y} = \bar{X} - k$. (3 marks)

**Q2//A)** There are 3 arrangements of the word DAD, namely DAD, ADD, and DDA.

How many arrangements are there of the word PROBABILITY? (4 marks)

**B)** What is conditional probability? Let two dice are rolled. Then

A = 'sum of two dice equals 3' and B = 'at least one of the dice shows a 1'

(a) What is P(A|B)? (b) Are A and B independent? (6 marks)

**C)** Define probability function. Let C and D be two events with P(C) = 0.25, P(D) = 0.45, and P (C ∩ D) = 0.1. What is P ($C^c$ ∩ D)? (5 marks)

---

**Probability and statistics Second Stage\Mathematics Time: 90 minutes**

**28/3/2021**

**Q1/** If the random variables X and Y have the joint pdf $f(x,y) = \begin{cases} 2e^{-x-y} & ;\ 0 < x < y < \infty \\ 0 & elsewhere \end{cases}$,

then answer the following questions:

1) Are X any Y independent? 2) Find $E(Y|X = x)$ 3) Find $P(1 < Y < 2 \mid X = \frac{1}{2})$. (10 marks)

**Q2/ A)** Suppose the joint mgf $M(t_1, t_2)$ exist for random variables $X$ and $Y$. Prove that if $M(t_1, t_2) = M(t_1)M(t_2)$, then X and Y are independent variables. (8 marks)

**B)** Let X and Y have joint pdf, defined by

$$f(x,y) = \begin{cases} 4xy & ;\ 0 \le x \le 1, \quad 0 \le y \le 1 \\ 0 & elsewhere \end{cases}$$

Then find: 1) $F(x,y)$ 2) $P(X \le \frac{1}{2}, Y \le \frac{3}{4})$ 3) $Cov(X,Y)$ 4) Correlation coefficient. (12 marks)

**Q3//A)** How many 5-digit number can be formed from 3, 4, 6, 8, 5, 1, 7, 9? (3 marks)

**B)** What is conditional probability? Let two dice are rolled. Then

A = 'sum of two dice equals 7' and B = 'at least one of the dice shows a 2'

(a) Find P(A∩ $B$) (b) What is P(A|B)? (6 marks)

**C)** Define probability function. If that A and B be two non-mutually events in S. Suppose P(A) = 0.4, P(B) = 0.3 and P((A ∪ B)$^C$) = 0.42. Are A and B independent? (6 marks)