| **Final Exam of operation research (*Course Code414 math*) for 2-nd**<br>**2-st Semester – Academic Year 2022/2023** | |
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| **Exam date**: *11/6/2023* **Time**: **3** *hours*<br>**Total mark**: *160 marks* **Pages**: *5* | **Examiners**: **Dr. Mohammed Abuelhassen& Dr.** Alsayid alsanusiu **&Dr. Amal Aboelwafa** |

**Read carefully and answer the following question**

**Choose the correct answer (32 X 5=160 )**

1. This variable is introduced in the simplex method to eliminate greater-than (>) constrains
   a) Slack variable b) Artificial variable
   c) Surplus variable d) Non of these
2. Graphical method solve linear programming problem
   a) Corner point method b) Iso-cost method
   c) North –west corner method d) a&b
3. We use Lagrange multipliers method when condition …….only
   a) $<$ b) $=$
   c) $>$ d) $\leq$
4. If $f(x)=3x^2$ is said ……..
   a) Linear function b) Linear equation
   c) Cubic d) Non of these
5. Which of the following is nonlinear function
   a) $Z=x+\sin y$ b) $Z=xy+8x+6$
   c) $Z=\ln x+y+10$ d) Non of these
6. If the det(Hessian)<0 then the function is ……
   a) Convex b) Concave
   c) neither concave nor convex. d) Convex and concave

$$\min z = 2x + 4y \qquad \text{s.t} \begin{cases} x - y \le 8 \\ |x - y| \le 10 \\ x, y \ge 0 \end{cases}$$

7. Transfer the constrains to standard form

a) $\begin{cases} x - y + s_{1=8} \\ x - y + s_2 = 10 \\ -x + y + s_3 = 10 \\ x, y, s_1, s_2, s_3 \ge 0 \end{cases}$

b) $\begin{cases} \begin{cases} x - y + s_{1=8} \\ x - y + s_2 = 10 \end{cases} \\ x - y - s_3 = 10 \\ x, y, s_1, s_2, s_3 \ge 0 \end{cases}$

c) $\begin{cases} x - y + s_{1=8} \\ x - y + s_2 = 10 \\ x, y, s_1, s_2 \ge 0 \end{cases}$

d) Non of these

8. Transfer the objective function to standard form

a) $z = 2x + 4y + s_1 + s_2 + s_3$

b) $z = 2x + 4y + 0s_1 + 0s_2 - 0s_3$

c) $z = 2x + 4y + 0s_1 + 0s_2 + 0s_3$

d) Non of these

$$\text{Max. } Z = 2x + 4y \qquad \text{s.t} \begin{cases} 2x + 3y \le 30 \\ 5x + 4y \le 60 \\ x, y \ge 0 \end{cases}$$

9. By the corner point method, the vertices of the feasible region

a) $(0,12), (10,0), (8.6,4.3)$

b) $(15,0), (0,10), (8.6, 4.3)$

c) $(12,0), (0,10), (8.6, 4.3)$

d) $(12,0), (0,10), (4.3, 8.6)$

10. The maximum value of the objective function at the point

a) (12,0)

b) (0,10)

c) (0,15)

d) (8.6,4.3)

11. Max Z=

a) 60

b) 36

c) 50

d) 48

12. Range of $c_1$ (coefficient of x)

a) $\frac{8}{3} \le x \le 5$

b) $\frac{8}{5} \le x \le 3$

c) $\frac{8}{3} \le y \le 5$

d) $3 \le x \le 5$

13. Range of $c_2$ (coefficient of y)

a) $\frac{8}{3} \le x \le 5$

b) $\frac{8}{5} \le x \le 3$

c) $\frac{8}{5} \le y \le 3$

d) $\frac{8}{3} \le y \le 5$

The hessian matrix of the function $Z = -2x^2 - y^2 + xy + 8x + 3y$

$$H(x,y) = \begin{bmatrix} -4 & a_{12} \\ 1 & a_{22} \end{bmatrix}$$

14. $a_{12} = .....$

a) -4 b) 1

c) -2 d) 0

15. $a_{22} = .....$

a) -4 b) 1

c) -2 d) 0

16. The function $Z$ is …….

a) convex b) concave

c) neither concave nor convex d) convex and concave

By using Lagrange Multipliers solve this nonlinear problem

$$Z = -2x^2 - y^2 + xy + 8x + 3y$$

**s.t**

$$3000x + 1000y = 10000$$

$$x, y >= 0$$

17. X=

a) $\frac{28}{69}$ b) $\frac{69}{28}$

c) $\frac{73}{28}$ d) $\frac{28}{73}$

18. Y=

a) $\frac{28}{69}$ b) $\frac{69}{28}$

c) $\frac{73}{28}$ d) $\frac{28}{73}$

19. $\lambda = \ldots\ldots$

a) $\frac{1}{1000}$ b) $\frac{1}{2000}$

c) $\frac{1}{3000}$ d) $\frac{1}{4000}$

20. $Z = \ldots\ldots$

a) $\frac{841}{56}$ b) $\frac{750}{63}$

c) $\frac{1911}{66}$ d) $\frac{963}{53}$

The following transportation problem

| Suppliers / Consumers | $A$ | $B$ | $C$ | Available |
|---|---|---|---|---|
| I | 6 | 8 | 4 | 14 |
| II | 4 | 9 | 8 | 12 |
| III | 1 | 2 | 6 | 5 |
| Requirement | 6 | 10 | 15 | 31 |

21. The transportation modal is ……..

a) unbalanced b) balanced

22. The objective function is……..

a) $6x_{11} + 8\,x_{12} + 4x_{13} + 4x_{21} + 9x_{22} + 8x_{23} + x_{31} + 2x_{32} + 6x_{33}$

b) $x_{11} + x_{12} + x_{13} + x_{21} + x_{22} + x_{23} + x_{31} + x_{32} + x_{33}$

c) $x_{11} + 4x_{12} + 6x_{13} + 2x_{21} + 9x_{22} + 8x_{23} + 6\,x_{31} + 8x_{32} + 4x_{33}$

d) Non of these

23. Which of the following is not constrains supply

a) $x_{11} + x_{12} + x_{13} = 14$ b) $x_{21} + x_{22} + x_{23} = 12$

c) $x_{11} + x_{21} + x_{31} = 6$ d) Non of these

24. Which of the following is constrains demand

a) $x_{11} + x_{21} + x_{31} = 6$ b) $x_{12} + x_{22} + x_{32} = 10$

c) $x_{11} + x_{12} + x_{13} = 14$ d) a&b

25. By north-west corner method we get $x_{11}, x_{22}, x_{33}$ respectively

a) $6, 2, 5$ b) $6, 8, 2$

c) $8, 2, 10$ d) $2, 10, 5$

26. Min. cost =

a) 143 b) 228

c) 200 d) 220

A dietician wishes to mix two types of foods $F_1$ and $F_2$ in such a way that the vitamin contents of the mixture contains atleast 6 units of vitamin $A$ and 8 units of vitamin $B$. Food $F_1$ contains 2 units/kg of vitamin A and 3 units/kg of vitamin B while food $F_2$ contains 3 units/kg of vitamin A and 4 units/kg of vitamin B. Food $F_1$ costs Rs. 50/kg and food $F_2$ costs Rs. 75/kg.

27. The objective function of minimize the cost of mixture
    a) $z = 50x + 75y$
    b) $z = 2x + 3y$
    c) $z = 3x + 4y$
    d) Non of these
28. Subject to the constrains :
    a) $\begin{cases} 2x + 3y \geq 8 \\ 3x + 4y \geq 6 \\ x, y \geq 0 \end{cases}$
    b) $\begin{cases} 2x + 3y \geq 6 \\ 3x + 4y \geq 8 \\ x, y \geq 0 \end{cases}$
    c) $\begin{cases} 2x + 3y \leq 8 \\ 3x + 4y \leq 6 \\ x, y \geq 0 \end{cases}$
    d) Non of these

$$\begin{aligned} &\textit{Maximize} && Z = x_1 + x_2 + 3x_3 \\ &\textit{Subject to} && 3x_1 + 2x_2 + x_3 \leq 3 \\ & && 2x_1 + x_2 + 2x_3 \leq 2 \\ & && x_1, x_2, x_3 \geq 0. \end{aligned}$$

29. Using simplex method converted into equations
    a) $\begin{cases} z = 0 \\ 3x_1 + 2x_2 + x_3 + s_1 = 3 \\ 2x_1 + x_2 + 2x_3 + s_2 = 2 \end{cases}$
    b) $\begin{cases} z = 0 \\ 3x_1 + 2x_2 + x_3 - s_1 = 3 \\ 2x_1 + x_2 + 2x_3 - s_2 = 2 \end{cases}$
    c) $\begin{cases} z = x_1 + x_2 + 3x_3 + s_1 + s_2 \\ 3x_1 + 2x_2 + x_3 + s_1 = 3 \\ 2x_1 + x_2 + 2x_3 + s_2 = 2 \end{cases}$
    d) Non of these
30. In the first table the entering variable is
    a) $x_1$
    b) $x_2$
    c) $x_3$
    d) $s_1$
31. In the first table the departing variable
    a) $s_1$
    b) $s_2$
    c) $x_1$
    d) a&b
32. the maximize value Z=
    a) 4
    b) 2
    c) 3
    d) 5

**Final Exam of Probabilities theory (*Course Code: MATH242*)**

**for 2-nd level students credit hours – Mathematics program**

**2-nd Semester – Academic Year 2022/2023**

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|---|---|
| **Exam date:** *11/06/2023* **Time:** *2 hour*<br>**Total mark:** *40 marks* **Pages:** *4* | **Examiners:** 1– D. Nasser Amin<br>2– Prof. Dr. Ahmed A. Soliman<br>3– D. Al-wageh A. Farghal |
| **Student Name:** | **Program: Mathematics** |

## Question (1): Mark each of the following true or false *[10 marks, 1 point each]*

1- Let A and B be events on the same sample space, with P (A) = 0.6 and P (B) = 0.7. The two events are disjoint?

2– Alice has 2 kids and one of them is a girl. The probability that the other child Is also a girl equal 1/3.

3- A six-sided die is tossed three times. The probability of observing three ones in a row is 3 / 216.

4- The Complement of P(A|B) is $\mathbf{P}(\boldsymbol{A}' \mid \boldsymbol{B})$.

5- If P(A|B) = 0.3 and P(B) = 0.8, then $P(A \cap B) = 0.24$.

6- Events A and B are mutually exclusive. Then P(A|B)=P(A).

7- Events A and B are independent, P(A)=0.4 and P(B)=0.5. Then $P(A \cup B) = 0.9$

8- An experiment consists of tossing 5 coins successively. The number of sample points in this experiment is 16.

9- If P(A|B)=0.3. Then P(B|A)=0.7.

**10- A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random with not replacement. The probability that none of the balls drawn is blue is $\frac{10}{21}$.**

**Read carefully and answer the following questions please. ( 30 Marks, *2.0 point each* )**

**1– Let X be a continuous random variable with the density fun**

$f(x) = \frac{1}{2}\ e^{\frac{-x}{2}}\ ,\quad x > 0,$ **then the median is**

a. 2 ln 2 b. – 2 ln 2 c. 2 d. None of these.

**2– Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. Then, the probability that the ticket drawn has a number which is a multiple of 3 or 5?**

a. $\frac{1}{20}$ b. $\frac{9}{20}$ c. $\frac{5}{20}$ d. None of these.

**3– In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. The probability that it is neither red nor green?**

a. $\frac{6}{21}$ b. $\frac{14}{21}$ c. $\frac{7}{21}$ d. None of these.

**4– Let X be a continuous random variable with the density function**

$f(x) = 2\ x\, e^{-2x}\ ,\ x > 0$ **. Then, P( X > 0) =**

a. 0.32 b. 0 c. 1 d. None of these.

**5– Let X be a random variable has a moment generating function is given by** $M(t) = (1-3t)^{-2}$, **and Y = 2 x + 5. Then E(y) =**

a. 11 b. 17 c. 12 d. None of these.

**6– Urn I contain three red chips and five white chips; Urn II contains four reds and four whites; Urn III contains five reds and three whites. One urn is chosen at random and one chip is drawn from that urn. Given that the chip drawn was red. The probability that taken from the urn III?**

a. $\frac{5}{12}$ b. $\frac{5}{24}$ c. $\frac{16}{24}$ d. None of these.

**7– If** $E(x) = 3$ and $V(x) = 16$, Then $E(x^2) =$

a. 25 b. 16 c. 19 d. None of these.

**8– Two dice are tossed simultaneously. The probability that the sum of the numbers appearing on the dice is a prime number.**

a. $\frac{5}{36}$ b. $\frac{5}{12}$ c. $\frac{16}{36}$ d. None of these.

**9– Let X be a continuous random variable with the density function** $f(x) = 2x$, $0 < x < 1$. **Then the skewness coefficient** ( $\alpha_3$ = )

a. – 0.5 b. 0.23 c. 0 d. None of these.

**10– If A and B are independent events then which of the following statements are true**

a. A and $B'$ are independent
b. $A'$ and $B'$ are independent
c. $A'$ and B are independent
d. All the above

**11- If A and B are independent events, P(A) = 0.5 and P(B) = 0.6.**

**Then P( $A' \cap B'$ ) =**

a. 0.2 b. 0.3 c. 0.5 d. None of these.

**12– If P( A∩ $B'$ ) = 0.3 ,** $P(A \cup B)$ **= 0.8 and P( A∩B ) = 0.1, then P( A|B) =**

a. 0.3 b. 0.2 c. 0.5 d. None of these.

**13- If A and B are exclusive events, P ( A ) = 0.5 and P ( B ) = 0.2. Then**

**P( A | B ) =**

a. 0.5 b. 0.1 c. 0 d. None of these.

**14– Let X be a random variable has the mass function**

$$P(x) = \begin{cases} \frac{1}{9} & , \ x = -2, 0, 2 \\ \frac{2}{9} & , \ x = -1, 1, 3 \\ 0 & , \ O.W. \end{cases} \text{ , and if:}$$

$A = \{x: -1 < x < 3\}$ and $B = \{x: -2 \leq x \leq 3\}$ , then $P(B \cup A) =$

a. 1 b. 0.7 c. 0.4 d. None of these

**15– Let X be a random variable has the density function**

$f(x) = 9\,x\,e^{-3x}$ , $x > 0$ . And Y = 3 x , then V( y ) =

a. 2 b. $\frac{2}{18}$ c. 18 d. None of these

**END OF EXAMINATION**