

King Fahd University of Petroleum and Minerals  
Dhahran 31261

**Department of Mathematical Sciences**

**MATH 131 – 01/02 & 04 (052)**

**Final Exam<sup>1</sup>**

**May 30<sup>th</sup>, 2006**

**Instructor. Dr. A. Umar**

Time Allowed	2hrs 45 mins
Time	07.30-10.15 hrs

**Name:** \_\_\_\_\_

**ID Number:** \_\_\_\_\_ **Encircle Your Section: 01 / 02 / 04 (-5 points)**

**Notes:**

1. Students must have a valid KFUPM ID Card with them.
- 2 Use the cover page where appropriate.
3. You **must** show all your work (in **Section B**) to justify your answer. Be as organized as possible.
4. A scratch paper is attached at the end of this question paper. **PLEASE, DO NOT REMOVE IT.**
5. Programmable Calculators and Mobile Phones are **NOT** allowed.

Questi	A	B	C	D	E	Points
1						6
2						6
3						6
4						6
5						6
6						6
7						6
8						6
9						6
10						6
11						6
12						6
13						6
14						6
15						6
16						6
17						6
18						6
19						6
20						6

Question	Points
21	
22	
23	
24	
Sub-Total	
Total 1	
Total	

**SECTION A .** Each question carries 6 points

**Q1.** A new video recorder depreciates SR200 per year, and it is worth SR780 after 5 years. Find a function that describes the value of this video, if  $t$  is the age of the video in years.

(a)  $f(t) = 200t + 780$

(b)  $f(t) = -200t + 1780$

(c)  $f(t) = 200t - 1780$

(d)  $f(t) = 200t - 780$

(e)  $f(t) = -200t + 780$

**Q2.** A corn refining company produces corn gluten cattle feed at a variable cost of SR80 per ton. If transportation costs per month are SR51,000 and other fixed costs are SR110,000 per month, and the feed sells for SR126 per ton, how many tons should be sold for the company to have a monthly profit of SR460,000?

(a) 25,000   (b) 16,500   (c) 13,500   (d) 45,500   (e) 52,500

**Q3.** The cost of publication of each copy of a magazine is SR5.26. It is sold to dealers for SR5 each, and the amount received for advertising is 12% of the amount received for all magazines issued beyond 5,000. If 200,000 units have been produced/sold, find the total profit made (in SR) by the publisher.

- (a) 55,000 (b) 95,000 (c) 85,000 (d) 75,000 (e) 65,000

**Q4.** Find two (whole) numbers whose sum is 78 and whose product is a maximum.

- (a) (20, 58) (b) (35, 43) (c) (37, 41) (d) (45, 33) (e) (39, 39)

**Q5.** A debt of SR7000 due in five years is to be repaid by a payment of SR3000 now and a second payment of SR3001 four years from now. If interest is compounded quarterly, what is the periodic rate of interest?

- (a) 1.25%   (b) 1.29%   (c) 1.21%   (d) 1.27%   (e) 1.23%

**Q6.** For an interest rate of 6% compounded every four months, find the amount of an annuity consisting of SR1500 at the beginning of each 4-month period for 36 months.

- (a) SR5005   (b) SR14925   (c) SR19370   (d) SR3001   (e) SR SR4340

**Q7.** For an interest rate of 6% compounded monthly, find the present value of an annuity consisting of SR750 at the end of each month for six months and SR 500 thereafter at the end of each month for two more years.

- (a) SR5005 (b) SR14925 (c) SR15370 (d) SR3001 (e) SR SR4340

**Q8.** Find the corner points of the feasible region for the given inequalities:

$$x + 2y \geq 80, 21x + 7y \geq 840, x + y \leq 120 \quad x, y \geq 0.$$

- (a) (40, 20), (32, 40), (0, 120), (80, 0);  
(b) (40, 20), (120, 0), (0, 120), (80, 0);  
(c) (40, 20), (120, 0), (0, 120), (0, 80);  
(d) (32, 24), (120, 0), (0, 120), (80, 0);  
(e) (32, 24), (120, 0), (0, 100), (0, 80).

**Q9.** The maximum value of  $P = x - y$  over the region in the above question is

- (a) 140 (b) 160 (c) 180 (d) 100 (e) 120

**Q10.** An artist has created 12 original paintings, and she will exhibit all of them in three galleries. Two will be sent to gallery U, 5 to gallery V and 5 to gallery W. In how many ways can this be done?

- (a) 16632    (b) 30240    (c) 5040    (d) 12964    (e) 2520

**Q11.** Two events are said to be *independent* if

- (a) their probabilities equal  $1/2$  each;
- (b) the outcome of one does not affect the other;
- (c) there is no common sample point between them;
- (d) there is exactly one sample point between them;
- (e) none of the above.

**Q12.** A *certain event* is one in which

- (a) its probability equals  $1/2$ ;
- (b) all outcomes are equally likely to occur;
- (c) its probability equals 1;
- (d) there is exactly one sample point;
- (e) none of the above.

**Use this for questions 13 and 14.** A survey of 500 students resulted in the data shown in the table below. It shows the type of college the student attends and the income level of the student's family. Suppose a student in the survey is randomly selected.

Income	College		
	Private	Public	Total
High	50	25	75
Middle	100	125	225
Low	25	175	200
Total	175	325	500

**Q13.** Find the probability that the student attends a public college, given that the student comes from a low-income family.

- (a)  $\frac{200}{256}$
- (b)  $\frac{13}{16}$
- (c)  $\frac{8}{75}$
- (d)  $\frac{7}{8}$
- (e)  $\frac{7}{20}$

**Q14.** If the student attends a private college, find the probability that the student comes from a high-income family.

- (a)  $\frac{1}{10}$
- (b)  $\frac{13}{16}$
- (c)  $\frac{8}{75}$
- (d)  $\frac{200}{225}$
- (e)  $\frac{2}{7}$

**Q15.** An urn consists of FOUR red, SIX white and FIVE green marbles. If two marbles are randomly drawn with replacement find the probability that the first marble is red or the second is white.

- (a)  $\frac{2}{3}$
- (b)  $\frac{5}{9}$
- (c)  $\frac{8}{75}$
- (d)  $\frac{13}{16}$
- (e)  $\frac{200}{225}$

**Q16.** An *equi-probable* sample space is

- (a) the set of all outcomes of the experiment;
- (b) a space in which all outcomes are equally likely to occur;
- (c) one that contains the list of all possible values of  $X$ ;
- (d) one that contains the list of probabilities for all values of  $X$ ;
- (e) none of the above.

**Q17.** A landscaper earns SR 300 per day when working and loses SR 50 per when not working. If the probability of working on any day is  $\frac{4}{7}$ , find  $s$ . [Hint. Let  $X$  be the landscaper's earnings per day.]

- (a) 173      (b) 168      (c) 156      (d) 150      (e) 146

**Q18.** For a family with FIVE children ordered by birth, find the probability that at least two are girls and at least two are boys. (Assume that there are only boy(s) and girl(s) and the probability that a child is a girl is  $\frac{1}{2}$ .)

- (a)  $\frac{5}{9}$
- (b)  $\frac{13}{16}$
- (c)  $\frac{8}{75}$
- (d)  $\frac{5}{8}$
- (e)  $\frac{200}{256}$



**Q19.** For the standard normal random variable  $Z$  find  $z_0$  such that  $P(-z_0 < Z < z_0) = 0.1974$ .

- (a) 0.12      (b) 0.20      (c) 0.09      (d) 0.34      (e) 0.25

**Q20.** If  $X$  is normally distributed with  $m = 60$  and  $P(X > 54) = 0.901$ , find  $s$ .

- (a) 4.0      (b) 4.1      (c) 4.3      (d) 4.4      (e) 4.7

**SECTION B. Only complete and clear solutions will be graded.**

**Q21.** If three fair coins are tossed, let E be the event "at most one head" and F the event "exactly two tails ". Determine whether E and F are dependent or independent. [12 pts]

**Q22.** Mathematical Modeling. The Al-Kanawy Food Company has SR 30,000 for the purchase of food stuff to make three types of pizzas. The company has allocated a total of 1200 hours/quarter of production time and 18 hours packaging time for the pizzas. The following table gives the cost per pizza, the number of hours/mins. per pizza, and the profit per pizza for each type. Set up a linear programming problem that maximizes profit. [16 pts]

	Cost/Pizza	Prod. Hours /Pizza	Pack. Mins/Pizza	Profit/ Pizza
Type 1	SAR 40	0.25	3	SAR 25
Type 2	SAR 30	0.2	2.5	SAR 15
Type 3	SAR 20	0.18	2	SAR10
Available Time	*	1200 hrs.	18 hrs	*

**Q23.** Find the basic feasible solution (BFS) and quotients associated with the following simplex tableau of some linear programming problem.

$$\begin{array}{c}
 x_3 \\
 s_2 \\
 x_2 \\
 \hline
 \end{array}
 \left[ \begin{array}{cccccc|c}
 x_1 & x_2 & x_3 & s_1 & s_2 & s_3 & Z \\
 1 & 0 & 1 & 1 & 0 & 3 & 0 & 27 \\
 -3 & 0 & 0 & 0 & 1 & 4 & 0 & 18 \\
 -2 & 1 & 0 & 0 & 0 & 1 & 0 & 9 \\
 \hline
 3 & 0 & 0 & 3 & 0 & -7 & 1 & 98
 \end{array} \right]$$

Variable	$x_1$	$x_2$	$x_3$	$s_1$	$s_2$	$s_3$	Z
Value							
Row	1	2	3				
Quotients							

[14 pts]

**Q24.** For the data:

3, 5, 7, 8, 6, 8, 14, 13, 12, 14, 6, 8, 8, 14, 2, 1, 16, 14.

(a) Find the mean, median and mode(s)

[15 pts]

(b) For the above data which is the worst average and why? [3 pts]

**Scratch Paper. Please DO NOT REMOVE.**

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**SECTION A .** Each question carries 6 points

**Q1.** A new video recorder depreciates SR200 per year, and it is worth SR780 after 5 years. Find a function that describes the value of this video, if  $t$  is the age of the video in years.

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(a) 25,000   (b) 16,500   (c) 13,500   (d) 45,500   (e) 52,500

**Q3.** The cost of publication of each copy of a magazine is SR5.26. It is sold to dealers for SR5 each, and the amount received for advertising is 12% of the amount received for all magazines issued beyond 5,000. If 200,000 units have been produced/sold, find the total profit made (in SR) by the publisher.

- (a) 65,000 (b) 75,000 (c) 85,000 (d) 95,000 (e) 55,000

**Q4.** Find two (whole) numbers whose sum is 78 and whose product is a maximum.

- (a) (39, 39) (b) (35, 43) (c) (37, 41) (d) (45, 33) (e) (20, 58)

**Q5.** A debt of SR7000 due in five years is to be repaid by a payment of SR3000 now and a second payment of SR3001 four years from now. If interest is compounded quarterly, what is the periodic rate of interest?

- (a) 1.23%   (b) 1.29%   (c) 1.21%   (d) 1.27%   (e) 1.25%

**Q6.** For an interest rate of 6% compounded every four months, find the amount of an annuity consisting of SR1500 at the beginning of each 4-month period for 36 months.

- (a) SR4340   (b) SR3001   (c) SR19370   (d) SR14925   (e) SR SR5005



**Q7.** For an interest rate of 6% compounded monthly, find the present value of an annuity consisting of SR750 at the end of each month for six months and SR 500 thereafter at the end of each month for two more years.

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(b) ((32, 24), (120, 0), (0, 120), (80, 0);  
(c) (40, 20), (120, 0), (0, 120), (0, 80);  
(d) (40, 20), (120, 0), (10, 120), (80, 0);  
(e) (32, 24), (120, 0), (0, 100), (0, 80).

**Q9.** The maximum value of  $P = x - y$  over the region in the above question is

- (a) 120 (b) 100 (c) 180 (d) 160 (e) 140

**Q10.** An artist has created 12 original paintings, and she will exhibit all of them in three galleries. Two will be sent to gallery U, 5 to gallery V and 5 to gallery W. In how many ways can this be done?

- (a) 2520    (b) 30240    (c) 5040    (d) 12964    (e) 16632

**Q11.** Two events are said to be *independent* if

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**Q13.** Find the probability that the student attends a public college, given that the student comes from a low-income family.

- (a)  $\frac{200}{256}$
- (b)  $\frac{7}{8}$
- (c)  $\frac{8}{75}$
- (d)  $\frac{13}{16}$
- (e)  $\frac{7}{20}$

**Q14.** If the student attends a private college, find the probability that the student comes from a high-income family.

- (a)  $\frac{2}{7}$
- (b)  $\frac{13}{16}$
- (c)  $\frac{8}{75}$
- (d)  $\frac{200}{225}$
- (e)  $\frac{1}{10}$

**Q15.** An urn consists of FOUR red, SIX white and FIVE green marbles. If two marbles are randomly drawn with replacement find the probability that the first marble is red or the second is white.

- (a)  $\frac{8}{9}$
- (b)  $\frac{5}{9}$
- (c)  $\frac{8}{75}$
- (d)  $\frac{13}{16}$
- (e)  $\frac{2}{3}$

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- (a) 146      (b) 152      (c) 158      (d) 168      (e) 173

**Q18.** For a family with FIVE children ordered by birth, find the probability that at least two are girls and at least two are boys. (Assume that there are only boy(s) and girl(s) and the probability that a child is a girl is  $\frac{1}{2}$ .)

- (a)  $\frac{5}{9}$
- (b)  $\frac{5}{8}$
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- (d)  $\frac{13}{16}$
- (e)  $\frac{200}{256}$

**Q19.** For the standard normal random variable  $Z$  find  $z_0$  such that  $P(-z_0 < Z < z_0) = 0.1974$ .

- (a) 0.25      (b) 0.20      (c) 0.09      (d) 0.34      (e) 0.12

**Q20.** If  $X$  is normally distributed with  $m = 60$  and  $P(X > 54) = 0.901$ , find  $s$ .

- (a) 4.7      (b) 4.4      (c) 4.3      (d) 4.2      (e) 4.0

**SECTION B. Only complete and clear solutions will be graded.**

**Q21.** If three fair coins are tossed, let E be the event "at most one head" and F the event "exactly two tails ". Determine whether E and F are dependent or independent. [12 pts]

**Q22.** Mathematical Modeling. The Al-Kanawy Food Company has SR 30,000 for the purchase of food stuff to make three types of pizzas. The company has allocated a total of 1200 hours/quarter of production time and 18 hours packaging time for the pizzas. The following table gives the cost per pizza, the number of hours/mins. per pizza, and the profit per pizza for each type. Set up a linear programming problem that maximizes profit. [16 pts]

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 \left[ \begin{array}{cccccc|c}
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 1 & 0 & 1 & 1 & 0 & 3 & 0 & 27 \\
 -3 & 0 & 0 & 0 & 1 & 4 & 0 & 18 \\
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 \end{array} \right]$$

Variable	$x_1$	$x_2$	$x_3$	$s_1$	$s_2$	$s_3$	Z
Value							
Row	1	2	3				
Quotients							

[14 pts]

**Q24.** For the data:

3, 5, 7, 8, 6, 8, 14, 13, 12, 14, 6, 8, 8, 14, 2, 1, 16, 14.

(a) Find the mean, median and mode(s)

[15 pts]

(b) For the above data which is the worst average and why? [3 pts]

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