King Fahd University of Petroleum and Minerals
Dhahran 31261

**Department of Mathematical Sciences**
**MATH 131 – 01 & 02 (042)**
**Final Exam[2]**
**June 07th , 2005**
**Instructor. Dr. A. Umar**

| | |
|---|---|
| Time Allowed | 2hrs 45 mins |
| Time | 07.30-10.15 hrs |

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**Name**:_____

**ID Numbe**r:_____**Encircle Your Section: 01 / 02 (9.00 -9.50)**

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**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 | | | | | | 7 |
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| Question | Points | |
|---|---|---|
| 21 | | |
| 22 | | |
| 23 | | |
| 24 | | |
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| Sub-Total | | |
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| Total 1 | | |
| | | |
| Total | | |

**SECTION A** . Each question carries 7 points

**Q1**. A salesperson needs to calculate the cost $c$ of an item with a sales tax of 6.25%. A linear equation that represents the total cost $c$, (of an item) costing $x$ Saudi riyals is

(a) $c = x + 0.0625$

(b) $c = 1.0625x$

(c) $c = 1.625x$

(d) $c = x - 0.0825$

(e) $c = 7.25x$

**Q2**. A corn refining company produces corn gluten cattle feed at a variable cost of SR76 per ton. If 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 SR540,000?

(a) 25,000 (b) 16,525 (c) 52,655 (d) 45,250 (e) 13,000

**Q3.** The cost of publication of each copy of a magazine is SR3.26. It is sold to dealers for SR3 each, and the amount received for advertising is 12% of the amount received for all magazines issued beyond 5,000. Find the least number of magazines that can be published to make a profit of SR34,200. [0.36(5000) = 1800.]

(a) 100,000 (b) 250,000 (c) 200,000 (d) 360,000 (e) 500,000

**Q4**. The market equilibrium point for a product occurs when 12,000 units are produced at a price of SR80 per unit. The consumers will demand no units when the price is SR200, and the supplier will supply no units when at SR20 per unit. The supply equation (given that it is linear) is

(a) $p = -\frac{q}{20} + 200$

(b) $p = -\frac{q}{200} - 20$

(c) $p = \frac{q}{200} + 20$

(d) $p = \frac{q}{200} - 20$

(e) $p = -\frac{q}{20} + 200$

**Q5.** A debt of SR7000 due in five years is to be repaid by a payment of SR3000 now and a second payment four years from now. If the interest rate is 5% compounded quarterly, how much is the second payment (to the nearest riyal)?

(a) SR4340 (b) SR3001 (c) SR20001 (d) SR5005 (e) SR19370

**Q6.** For an interest rate of 6% compounded every four months, find the amount of an annuity consisting of SR500 at the beginning of each 4-month period for 2 years and 8 months.

(a) SR19370 (b) SR5005 (c) SR20001 (d) SR3001 (e) SR4340

**Q7.** For an interest rate of 6% compounded monthly, find the present value of an annuity consisting of SR500 at the end of each month for six months and SR 750 thereafter at the end of each month for two more years.

(a) SR19370(b) SR5005 (c) SR20001 (d) SR3001 (e) SR SR4340

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

$$x + 2y \geq 80,\ 3x + 2y \geq 160,\ 5x + 2y \geq 200,\quad x,\ y \geq 0.$$

(a) (20, 40), (20, 50), (100, 0), (80, 0);
(b) (40, 20), (20, 50), (100, 0), (0, 80);
(c) (20, 40), (50, 20), (100, 0), (0, 80);
(d) (40, 20), (20, 50), (0, 100), (80, 0);
(e) (40, 20), (50, 20), (0, 100), (0, 80).

**Q9.** The minimum value of $P = 4x + 2y$ over the region in the above question is

(a) 140 (b) 320 (c) 180 (d) 200 (e) 160

**Q10**. An artist has created 10 original paintings, and she will exhibit all of them in three galleries. Two will be sent to gallery U, 3 to gallery V and 5 to gallery W. In how many ways can this be done?

(a) 720 (b) 30240 (c) 5040 (d) 2900 (e) 2520

**Q11**. Two events are said to be mutually-exclusive if

**(a)** each contains some of the outcomes of the experiment;
**(b)** there is no common sample point between them;
**(c)** half the outcomes of the experiment are included;
**(d)** there is exactly one sample point between them;
**(e)** none of the above.

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

**(a)** all the outcomes of the experiment are included;
**(b)** all outcomes are equally likely to occur;
**(c)** half the outcomes of the experiment are included;
**(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.

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

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

(a) $\frac{200}{256}$

(b) $\frac{2}{3}$

(c) $\frac{8}{75}$

(d) $\frac{13}{16}$

(e) $\frac{5}{9}$

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

(a) $\frac{5}{9}$

(b) $\frac{13}{16}$

(c) $\frac{8}{75}$

(d) $\frac{2}{3}$

(e) $\frac{200}{256}$

**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 white and the second is red.

(a) $\frac{5}{9}$

(b) $\frac{2}{3}$

(c) $\frac{8}{75}$

(d) $\frac{13}{16}$

(e) $\frac{200}{256}$

**Q16.** The distribution of a random variable X is

**(a)** the outcomes of the experiment**;**
**(b)** an event where all outcomes are equally likely to occur**;**
**(c)** the list of all possible values of X;
**(d)** the list of probabilities for all possible 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 the landscaper's expected daily earnings. [Hint. Let X be the landscaper's earnings per day.]

(a) 170 (b) 110 (c) 130 (d) 150 (e) 50

**Q18.** For a family with FIVE children, find the probability that at least two are girls. (Assume that 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) $\frac{2}{3}$
(e) $\frac{200}{256}$

**Q19.** For the standard normal random variable $Z$ find $z_0$ such that $P(-z_0 < Z < z_0) = 0.2662$.

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

**Q20.** If $X$ is normally distributed with $m = 40$ and $P(X > 54) = 0.0401$, find $s$.

(a) 8.50 (b) 8.56 (c) 8.52 (d) 8.54 (e) 8.58

**SECTION B. Only complete and clear solutions will be graded. Each question has 10 points.**

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

**Q22.** Find the dual of the following LPP. [Do not solve.]

Minimize $P = 4x_1 + 4x_2 + 6x_3$,

subject to: $x_1 - x_2 + x_3 \geq 1$,

$-x_1 + x_2 + x_3 \geq 2$,

$x_1, x_2, x_3 \geq 0$.

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

| | $x_1$ | $x_2$ | $x_3$ | $s_1$ | $s_2$ | $s_3$ | Z | |
|---|---|---|---|---|---|---|---|---|
| $x_3$ | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 16 |
| $s_2$ | –3 | 0 | 0 | 0 | 1 | 0 | 0 | 18 |
| $x_2$ | –2 | 1 | 0 | 0 | 0 | 1 | 0 | 9 |
| | 3 | 0 | 0 | 3 | 0 | –7 | 1 | 62 |

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

**Q24.** For a biased coin, *P(H) = 0.45* and *P(T) = 0.55*. If the coin is tossed 100 times what is the probability of getting exactly 70 tails? Use normal approximation to the binomial.
[(0.55)(0.45) = 0.2475]

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**SECTION A**. Each question carries 7 points

**Q1**. A salesperson needs to calculate the cost $c$ of an item with a sales tax of 6.25%. A linear equation that represents the total cost $c$, (of an item) costing $x$ Saudi riyals is

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| | 3 | 0 | 0 | 3 | 0 | –7 | 1 | 62 |

| Variable | $x_1$ | $x_2$ | $x_3$ | $s_1$ | $s_2$ | $s_3$ | Z |
|---|---|---|---|---|---|---|---|
| Value | | | | | | | |

| Row | 1 | 2 | 3 |
|---|---|---|---|
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