KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS

DEPARTMENT OF MATHEMATICS & STATISTICS

MATH131 - Term 142

Master | **Final Exam** | **Master**

Date: May 18, 2015 **Duration: 180 minutes**

Name: _____

ID #: __ __ __ __ __ __ __ __ __ **Section #:** __ __ **Serial #:** __ __

Important Instructions:

- ***Electronic approved calculators*** are allowed. Mobiles are NOT allowed.
- Make sure that you have **14** pages of problems (Total of **28** Questions).
- Write your name, ID number and Section number on the examination paper and in the upper left corner of the answer sheet.
- When bubbling your ID number and Section number, be sure that the bubbles match with the numbers that you write.
- The Test Code Number is already bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
- When bubbling, make sure that the bubbled space is fully covered.
- When erasing a bubble, make sure that you do not leave any trace of pencilling.

Question 1

An artist has created 12 original paintings, and he will exhibit some of them in two galleries: 5 paintings will be sent to gallery *A*, and 4 to gallery *B*. In how many ways this can be done?

(a) 27720

(b) 792

(c) 827

(d) 392040

(e) 126

Question 2

A sales representative must visit 4 cities during a trip. Suppose that there are 10 cities in the geographic area the sales representative is to visit, and further that the sequence in which the visits to the 4 selected cities are scheduled is also of concern. How many different sequences are there of 4 cities chosen from the total of 10 cities?

(a) 5040

(b) 210

(c) 720

(d) 744

(e) 17280

Question 3

Assume the sample space for an experiment is given by:

$$S = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$$

Let A, B and C be the events:

$$A = \{2, 3, 5, 7, 11\} \qquad B = \{8, 9, 10, 11, 12\} \qquad C = \{3, 5, 7, 9, 11\}$$

The event $(A \cup B') \cap C$ is given by:

(a) $\{\mathbf{3}, \mathbf{5}, \mathbf{7}, \mathbf{11}\}$

(b) $\emptyset$

(c) $\{7, 11\}$

(d) $\{2, 3, 11\}$

(e) $\{3, 5, 9\}$

Question 4

If $P(A \cup B) = 0.55$, $P(A \cap B) = 0.15$, and $P(B) = 0.40$, then $P(A)$ is:

(a) 0.30

(b) 0.80

(c) 0.45

(d) 0.25

(e) 0.40

Question 5

Assume a single die is rolled. The odds in favor of the event of getting an even number is:

(a) 1:1

(b) 1:2

(c) 1:3

(d) 3:1

(e) 2:1

Question 6

Suppose the odds in favor of an event are 2:9. The probability that the event will NOT occur is:

(a) $^{9}/_{11}$

(b) $^{2}/_{11}$

(c) $^{2}/_{9}$

(d) $^{7}/_{11}$

(e) $^{2}/_{7}$

Question 7

If $P(A \cap B) = 0.10$, $P(A|B) = 0.25$, and $P(A) = 0.15$, then $P(A \cup B)$ is:

(a) 0.45

(b) 0.40

(c) 0.50

(d) 0.60

(e) 0.35

Question 8

Assume we have two independent events, A and B. If $P(A \cup B) = 70\%$ and $P(A \cap B) = 50\%$, then $P(A' \cap B')$ is:

(a) 30%

(b) 28%

(c) 60%

(d) 35%

(e) 20%

Question 9

A random variable X has the following distribution:

x	$P(X = x)$
0	0.15
1	a
2	0.25
3	b
4	0.10

If $E(X) = 2$, then $P(X > 2)$ is:

(a) 40%

(b) 50%

(c) 60%

(d) 25%

(e) 35%

Question 10

For a small car rental company, the following table gives the probability that x cars are rented daily.

x	$P(X = x)$
1	1/14
2	6/14
3	6/14
4	1/14

The value of the variance, $V(X)$, is:

(a) $\mathbf{^{15}/_{28}}$

(b) $^{5}/_{28}$

(c) $^{5}/_{14}$

(d) $^{1}/_{14}$

(e) $^{9}/_{14}$

Question 11

If X is a binomial random variable with $n = 20$ and $p = {}^{4}/_{5}$, then $P(X < 13)$ is:

(a) 0.0321

(b) 0.0867

(c) 0.8684

(d) 0.9423

(e) 0.0577

Question 12

A fair coin is tossed 15 times. The probability that at least 9 heads occur is:

(a) 0.3036

(b) 0.6964

(c) 0.8491

(d) 0.9408

(e) 0.1509

Question 13

If X is normally distributed with $\mu = 60$ and $\sigma = 10$, then the probability $P(50 < X < 75)$ is:

(a) 0.7745

(b) 0.0919

(c) 0.4332

(d) 0.5000

(e) 0.1587

Question 14

The yearly incomes of 10,000 professional employees, of a large corporation, are assumed to be normally distributed with mean \$75,000 and standard deviation \$15,000. How many of these employees have yearly income varies between \$30,000 and \$45,000?

(a) 215

(b) 4,987

(c) 4,772

(d) 9,759

(e) 512

Question 15

Suppose the cost to produce 10 units of a product is 40 Riyals and the cost to produce 20 units is 70 Riyals. If the cost, c, is linearly related to the number of units produced, q, then the cost to produce 16 units is:

(a) 58 Riyals

(b) 48 Riyals

(c) 68 Riyals

(d) 38 Riyals

(e) 78 Riyals

Question 16

The daily profit function, in thousands of Riyals, for a manufacturer's product is given by:

$$P(x) = -x^2 + 18x + 144$$

where x is the number of units sold. The production level that maximises the profit is:

(a) 9,000 units

(b) 8,000 units

(c) 16,000 units

(d) 17,000 units

(e) 18,000 units

Question 17

The supply and demand equations for a product is given by $p = \sqrt{q + 10}$ and $p = 20 - q$, respectively, where $p \geq 0$ represents the price per unit in dollars and $q \geq 0$ represents the number of units sold per time period. The revenue at the equilibrium point is equal to:

(a) 75 Riyals

(b) 100 Riyals

(c) 125 Riyals

(d) 50 Riyals

(e) 150 Riyals

Question 18

A manufacturer sells a product at 5 Riyals per unit, selling all produced. The monthly fixed cost is 5,000 Riyals and the variable cost (per unit) is 3 Riyals. Assume the manufactures produces q units (per month). The break-even quantity if the total revenue decreases by 20%, is:

(a) 5,000 units

(b) 2,500 units

(c) 3,000 units

(d) 4,000 units

(e) 4,500 units

Question 19

The effective rate that corresponds to a nominal rate of 14% compounded quarterly is approximately equal:

(a) 14.75%

(b) 3.5%

(c) 14.49%

(d) 14.93%

(e) 7%

Question 20

How many months would it take for a principal of $2,000 to accumulate to $5,000 if invested at 15% compounded monthly?

(a) 74 months

(b) 76 months

(c) 7 months

(d) 66 months

(e) 64 months

Question 21

The future value of an annuity consisting of equal payments of \$500 payable at the beginning of every month, if invested at 9% compounded monthly for three years, is (to the nearest dollar):

(a) \$20,731

(b) \$20,576

(c) \$19,669

(d) \$21,439

(e) \$18,000

Question 22

An annuity consisting of equal payments, R, payable at the end of each half-year for the next five years is to be purchased for \$15,000. If invested at the rate of 5% compounded semiannually, how much is each payment?

(a) \$1,713.88

(b) \$1,732.31

(c) \$1,942.57

(d) \$1,192.57

(e) \$1,614.35

Question 23

Consider the following nonlinear system:

$$\begin{cases} p^2 = 5 - q \\ p = q + 1 \end{cases}$$

Which statement of the following statements is TRUE about the above system?

(a) The system has exactly two solutions with $p \cdot q = 2$ or $p \cdot q = 12$

(b) The system has exactly one solution with $p + q = 3$

(c) The system has exactly one solution with $p - q = 1$

(d) The system has one-parameter family of solutions

(e) The system has no solution

Question 24

Consider the following linear system:

$$\begin{cases} 2x + y + 6z = 3 \\ x - y + 4z = 1 \\ 3x + 2y - 2z = 2 \end{cases}$$

Which statement of the following statements is TRUE about the above system?

(a) The system has exactly one solution with $x + y + z = 1.25$

(b) The system has exactly one solution with $x + y + z = 1$

(c) The system has one-parameter family of solutions

(d) The system has two-parameter family of solutions

(e) The system has no solution

Question 25

Consider the following homogeneous system:

$$\begin{cases} w + x + 2y + 7z = 0 \\ w - 2x - y + z = 0 \\ w + 2x + 3y + 9z = 0 \\ 2w - 3x - y + 4z = 0 \end{cases}$$

Which statement of the following statements is TRUE about the above system?

(a) The system has two-parameter family of solutions

(b) The system has one-parameter family of solutions

(c) The system has three-parameter family of solutions

(d) The system has only the trivial/unique solution, $w = x = y = z = 0$

(e) The system has no solution

Question 26

Suppose a feasible region is defined by the following system of inequalities:

$$\begin{cases} 2x + y \geq 6 \\ y \geq x \\ y \leq 5x + 2 \end{cases}$$

Which statement of the following statements is TRUE about the feasible region?

(a) The feasible region is unbounded and has two corners

(b) The feasible region is unbounded and has three corners

(c) The feasible region is bounded and has three corners

(d) The feasible region is bounded and has four corners

(e) The feasible region is empty

Question 27

A linear programming problem is to maximize the function:

$$P = 3q_1 + 6q_2$$

gives a closed feasible region with the following three corner points:

$$A(0,3), B(0,12), \text{and } C(12,6)$$

The optimal solution:

(a) Occurs at any point in the line $\overline{BC}$

(b) Occurs at B only

(c) Occurs at C only

(d) Occurs at A and B only

(e) Occurs at B and C only

Question 28

We use the dual and the simplex method to:

Minimize:

$$W = 8x + 12y$$

subject to:

$$\begin{aligned} 2x + 2y &\geq 3 \\ x + 3y &\geq 1 \\ x, y &\geq 0 \end{aligned}$$

The minimum is:

(a) 12

(b) 11

(c) 4

(d) 15

(e) 8