

Menoufia University
Faculty of Engineering, Shebien El-Kom
Civil Engineering Department.
First Semester Examination, 2013-2014
Date of Exam: 5 / 1 / 2014



Subject: Eng. Mathematics(3)
Code:
Year : 2nd
Time Allowed : 3 hours
Total Marks: 100 marks

Answer all the following questions:

Q.1

منتج وقود ينتج نوعين من البنزين التجاري نوع عادي ونوع ممتاز ويتطلب إنتاج أي من النوعين أن يمر بعمليتين تكسير وتقطير. بفرض أن كل وحدة من البنزين العادي تحتاج إلى:-

0.2 ساعة لعملية التكسير

0.5 ساعة لعملية التقطير

بينما يحتاج كل وحدة من النوع الممتاز تحتاج إلى:-

0.4 ساعة لعملية التكسير

0.2 ساعة لعملية التقطير

افرض أيضا أن الربح في كل نوع كالتالي:-

15\$ لكل وحدة قياس من النوع العادي

30\$ لكل وحدة قياس من النوع الممتاز

فإذا كان المصنع الخاص بعملية التكسير يعمل على الأكثر 8 ساعات

ضع المسألة السابقة في الصورة العامة للبرمجة الخطية.

(5 Marks)

(B) (i) Find **Graphically** the solution of the Linear programming problem

$$\text{Max } F = x_1 + x_2$$

St.

$$5x_1 + 10x_2 \leq 50$$

$$x_1 + x_2 \geq 1$$

$$x_2 \leq 4$$

$$x_1, x_2 \geq 0$$

then show on the graph each of the following expressions:

1) Vertex points

2) Convex set

3) Feasible region

4) Hyper plane

5) Optimal solution

Also, Solve the problem analytically using simplex method. (20 Marks)

(C) Give an example on a sample space: i) Finite and countable

ii) Infinite and countable

iii) Finite and uncountable (5 Marks)

(D) If the sample space of a random experiment is $S = \{1, 3, 5\}$, find

the algebra and verify that it satisfies the three conditions. (5 Marks)

(E) For any two events A and B, prove that

i) $P(A - B) = P(A \cap B') = P(A) - P(A \cap B)$

ii) If $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ (10 Marks)

(F) Suppose that an experiment of birth of 3 children

E_1 : is event that the first child is a boy,

E_2 : is event that the second child is a girl,

Are E_1 and E_2 independent events?

(5 Marks)

Q.2 (A) Three coins are tossed, write the sample space S and find the probability that all are heads **if**:

1- First coin is head.

2- At least one of the coins is head.

(10 Marks)

(B) Let A and B be events with $P(A \cup B) = \frac{7}{8}$, $P(A \cap B) = \frac{1}{4}$ and $P(A') = \frac{5}{8}$.

Find $P(A)$, $P(B)$ and $P(B \cap A')$

(5 Marks)

(C) Let X be a discrete random variable with the probability function

| | | | | | |
|------|-----|-----|-----|-----|-----|
| x | 0 | 1 | 2 | 3 | 4 |
| P(x) | 1/8 | 2/8 | 3/8 | 1/8 | 1/8 |

$P(x) = 0$ Elsewhere,

(a) Graph the probability function

(b) Find the distribution function

(c) Obtain its graph.

(10 Marks)

(D) For a continuous random variable, let $f(x) = \begin{cases} x & 0 \leq x \leq 1 \\ \frac{3-x}{4} & 1 \leq x \leq 3 \\ 0 & \text{elsewhere} \end{cases}$

Is $f(x)$ a density function? If so find the distribution function $F(x)$. (10 Marks)

(E) Find the arithmetic mean, Geometric mean, Harmonic mean, Mode and the Median for the following data: 8, 27, 14, 8, 12, 15 (5 Marks)

(F) One card is drawn randomly from a box containing 9 cards numbered from 1 to 9. Describe the sample space of this experiment, and then list each of the following events:

(i) A = Drawing a card numbered with an odd number

(ii) B = Drawing a card numbered with a prime number

(iii) Occurrence of A or B. (iv) Occurrence of A and B together.

(v) Occurrence of only A. (vi) Non-occurrence of A. (10 Marks)

With my best wishes

Dr. Islam Eldesoky

This exam measures the following ILOS

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|-----------------|----------------------------------|-----|-----|-----|---------------------|-----|-----|-----|---------------------|-----|-----|-----|
| Question Number | Q1a | Q1c | Q1f | Q2f | Q1b | Q1d | Q1e | Q2e | Q2a | Q2b | Q2c | Q2d |
| Skills | Knowledge & understanding skills | | | | Intellectual Skills | | | | Professional Skills | | | |