



**Answer the following questions( each question of 15 marks):**

1- Let the joint p.d.f of the discrete r.v's X and Y be:

$$p(x, y) = \frac{\lambda^{x+y}}{x! y!} e^{-2\lambda}, \quad x = 0, 1, 2, \dots \quad \text{and} \quad y = 0, 1, 2, \dots$$

prove that r.v's X and Y are independent .

2- Suppose that the joint p.d.f of the r.v's X and Y is given by :

$$f(x, y) = 4y(x-y)e^{-x-y}, \quad 0 \leq x \leq \infty, \quad 0 \leq y \leq x$$

Compute the conditional variance  $Var(x|y)$  .

3- Let the joint density function of X and Y given by :

$$f(x, y) = kxy^2, \quad 0 < x < y < 1$$

What is the value of the constant k ?

4- If the moment generating function of the random variables X and Y is :

$$M(s, t) = e^{(s+3t+2s^2+18t^2+12st)}$$

what is the covariance of X and Y ?

5- If the r.v's X and Y have  $\mu_x = 2, \mu_y = -3, \mu_z = 4, \sigma_x^2 = 1, \sigma_y^2 = 5, \sigma_z^2 = 2, \text{cov}(x, y) = -2$ ,  $\text{cov}(x, z) = -1$  and  $\text{cov}(y, z) = -1$ , find mean and variance of  $W = 4X - Y + 2Z$ .

6- Find the p.d.f of the sum of independent r.v's  $X_1, X_2, \dots, X_n$  which having Poisson distributions with respective parameters  $\lambda_1, \lambda_2, \dots, \lambda_n$  .

7- Let the joint density function of X and Y be given by :

$$f(x, y) = 2 \quad \text{if} \quad 0 < x < y < 1$$

find the correlation coefficient  $\rho(x, y)$  .

8- Suppose that the r.v X has standard normal distribution. Drive the p.d.f of the r.v  $Z = X^2$  .

9- Prove that the r.v  $Y = \frac{X - np}{\sqrt{npq}}$ , where X follows the binomial distribution with parameters n and p tends to standard normal distribution when  $n \rightarrow \infty$  .

10- Prove that the random variables X and Y are independent if and only if

$$M(t_1, t_2) = M(t_1) \times M(t_2).$$


EXAMINERS	PROF. DR./	DR/ ADEL EDRESS
	DR/	DR/

*With my best wishes*



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step 1, + 1 > 1

 <b>TANTA UNIVERSITY</b> <b>FACULTY OF SCIENCE</b> <b>DEPARTMENT OF MATHEMATICS</b>			
<b>EXAMINATION FOR STATISTIC (FOURTH YEAR) STUDENTS</b>			
<b>COURSE TITLE:</b>	<b>OPERATION RES. (1)</b>		<b>COURSE CODE: MA3103</b>
<b>DATE:</b>	<b>28/12/2016</b>	<b>TERM: SECOND</b>	<b>TOTAL ASSESS. MARKS: 150</b>
			<b>TIME ALLOWED: 2 H.</b>

**ANSWER THE FOLLOWING QUESTION:**

[1] Find the set of all vertices and determine graphically the optimal solution of the following Linear Program: (35 deg.)

$$LP \begin{cases} \max & z = -x_1 + 2x_2 \\ \text{s.t.} & x_1 + 2x_2 \leq 30, & 2x_1 + x_2 \leq 20, \\ & -5x_1 + 1.5x_2 \leq 15, & x_1, x_2 \geq 0 \end{cases}$$

[2] By simplex method solve of linear program: (40 deg.)

$$(LP) : \begin{cases} \min & z = -5x_1 - 8x_2 - 10x_3 \\ \text{s.t.} & x_1 + 2x_2 + 2x_3 \geq 120, \\ & -3x_1 + 2x_2 + x_3 \leq -90, \\ & 2x_1 + 4x_2 + 2x_3 \leq 100, \\ & x_1, x_2, x_3 \geq 0 \end{cases}$$

[3] By simplex method solve of following dual linear program: (35 deg.)


$$(D) : \begin{cases} \min & w = 120x_1 - 90x_2 + 100x_3 \\ \text{s.t.} & x_1 - 3x_2 + 2x_3 \geq 5, \\ & x_1 + 2x_2 + 4x_3 \geq 8, \\ & 2x_1 + x_2 + 2x_3 \geq 10 \\ & x_1, x_2, x_3 \geq 0 \end{cases}$$

[4] By northwest corner method and Vogel method solve of the transportation problem: (40 deg.)

	Demand			
Supply	5	9	6	5
7	4	7	10	3
10	7	5	6	9
8	3	6	5	8

<b>EXAMINERS</b>	<b>PROF. E. AMMAR</b>	<b>GOOD LOKE</b>
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2016/17 + 2016/17 + 2016/17

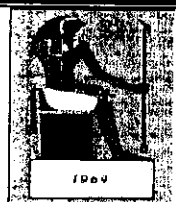
	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS			
	EXAMINATION FOR PROSPECTIVE STUDENTS (THIR D YEAR)			
	COURSE TITLE: NUMERICAL ANALYSIS		COURSE CODE: MA 3103	
DATE: 29 -12 - 2016	JANUARY 2016- 2017	TERM: FIRST	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

**Answer the following questions:**

- Graphically, find a real root for the nonlinear equation:  $x \log_{10} x = 1$ . (22 M)
- Find the cubic polynomial which takes the following values:  $f(0) = 1, f(1) = 0, f(2) = 1, f(3) = 10$ , then find  $f(0.5)$ . (20 M.)
- Prove that: i)  $\Delta = E\nabla$ , ii)  $\Delta^3(3e^x) = 3(e^{x+3h} - 3e^{x+2h} + 3e^{x+h} - e^x)$ . (20 M.)
- By the inverse matrix method, solve the following linear system:  
$$\begin{aligned} 3x_1 + x_2 + 2x_3 &= 3, \\ 2x_1 - 3x_2 - x_3 &= -3, \\ x_1 + 2x_2 + x_3 &= 4. \end{aligned}$$
 (22 M)
- Find  $f'(0.5), f''(0.5)$  and  $f'''(0.5)$  from the data:  $f(1) = 2, f(0) = -1$  and  $f(3) = 14$ , for the function  $f(x)$ . (22 M.)
- Evaluate the integral  $\int_0^1 \frac{2x}{x^2 + 1} dx$ , using Trapezoidal rule, with  $n = 8$ . (22 M.)
- Solve, using Picard's method, the initial value problem:  $y'' - y = 0, y(0) = y'(0) = 1$ . (22M.)

EXAMINERS	PROF. DR./ A. EL-NAMOURY	PROF DR/ A. A. HEMEDA
	DR/	DR/

*With my best wishes*

	Mathematics Department , Faculty of Science , Tanta University		
	Branch: Math. Dept.		Sub-branch : Statistics
	Examination for : Level three		Term: first Term 2016-2017
	Course Title: Design and Analysis of Algorithms		Course Code:CS3103
	Date: 14/1/2017	Total Mark: 100 marks	Time Allowed: 2 Hours

**Answer the following questions:**

**Question 1 (25 marks):**

- a) Define:  $\theta$ -notation,  $O$ -notation,  $\Omega$ -notation,  $o$ -notation,  $\omega$ -notation. (10 marks)
- b) Show that the sum of the first  $n$  positive integers is  $\theta(n^2)$ . (10 marks)
- c) Show that the polynomial  $f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$  is  $O(x^n)$ , where  $a_0, a_1, \dots, a_{n-1}, a_n$  are real numbers. (5 marks)

**Question 2 (20 marks):**

- a) Define the **recurrence** and then using recursion-tree method to find a good guess for the recurrence  $T(n) = 3T(\lfloor n/4 \rfloor) + \theta(n^2)$ . (10 marks)
- b) State master theorem and use it to get the order of growth in following :
- (i)  $T(n) = T(2n/3) + 1$ . (5 marks)      (ii)  $T(n) = 3T(n/4) + n \lg n$ . (5 marks)

**Question 3 (30 marks- each item 5marks):**

Define the **algorithm** and then compare between the Insertion and Merge algorithms in terms of:

(i) Problems which are solve.      (ii) efficiency.

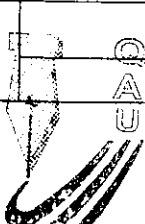
(iii) method of construction.      (iv) pseudocode.

(v) running time in best case and in worst case.      (vi) order of growth.

**Question 4 (25 marks):**

- a) Complete the following sentences: (5 marks)
- (i) A function  $f(n)$  is monotonically increasing if .....implies.....
- (ii) Any exponential function with a base strictly greater than 1 grows .....than any polynomial function.
- (iii) Loop invariant is a property or condition that is true ..... and ..... each iteration of a loop.
- b) Mark true or false, justify your answer:
- (i)  $f(n^2) = O(n)$  and  $f(n) = 3n^2 + 8n \log n = \theta(n^2)$ . (8 marks)
- (ii) The input size has the same definition in difference problems. (4 marks)
- (iii) The running time depends on the input size and the input case. So we have three cases to get running time. (4 marks)
- (v) Every correct algorithm is an efficient. (4 marks)

*with our Best Wishes*

Examiners		أ.د/السعيد ابراهيم عمار
		د/ إيمان غريب رزق
		جامعة طنطا - كلية العلوم
		QUALITY ASSURANCE UNIT FACULTY OF SCIENCE - TU



TANTA UNIVERSITY  
FACULTY OF SCIENCE  
DEPARTMENT OF MATHEMATICS

~~2017/2018~~  
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EXAMINATION FOR (THIRD YEAR) STUDENTS OF STATISTICS			
COURSE CODE:ST3105	Inventory System		COURSE TITLE:
TIME ALLOWED: 2 HOURS	TOTAL ASSESSMENT MARKS: 150	TERM: 1	23 -1- 2017

1-a – Define the inventory cycle. Evaluate the optimal order quantities for the modified penalty inventory model. (25 mark )

-b- Determine the minimum total cost for an inventory system when the replenishment occurs uniformly, no shortages are allowed and the production rate is greater than the demand rate. Also determine the sensitivity of this model. (25 mark )

2- a- Determine the optimal order quantity for the single period uniform demand multi-item probabilistic inventory model. (25 mark )

-b- Calculate the minimum total cost when the stock is reviewed continuously, the shortages are allowed , an order of size  $Q$  per cycle is placed every time the stock-level reaches a certain reorder point  $R$  and the demand during lead time is random variable follows the uniform distribution over  $(0,a)$  (25 mark)

3-a-Determine the optimal order quantity for the discrete probabilistic inventory model . (25 mark )

-b-. For SISS inventory model , by using a geometric programming approach. Determine optimal order quantity for the following :

$$TC = OC + HC + PC \quad \text{Subject to: } OC \leq k_1, HC \leq k_2 \quad (25 \text{ mark})$$

أطيب الأمنيات بالتوفيق والنجاح...

		EXAMINERS
Dr. Hala Ali Fergany	Dr. Neema Salha	



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EXAMINATION FOR (THIRD YEAR) STUDENTS OF STATISTICS

COURSE CODE:ST3105	Inventory System	COURSE TITLE:
TIME ALLOWED: 2 HOURS	TOTAL ASSESSMENT MARKS: 150	TERM: 1
		23 -1- 2017

1-a – Define the inventory cycle. Evaluate the optimal order quantities for the modified penalty inventory model. (25 mark )

-b- Determine the minimum total cost for an inventory system when the replenishment occurs uniformly, no shortages are allowed and the production rate is greater than the demand rate. Also determine the sensitivity of this model. (25 mark )

2- a- Determine the optimal order quantity for the single period uniform demand multi-item probabilistic inventory model. (25 mark )

-b- Calculate the minimum total cost when the stock is reviewed continuously, the shortages are allowed , an order of size  $Q$  per cycle is placed every time the stock-level reaches a certain reorder point  $R$  and the demand during lead time is random variable follows the uniform distribution over  $(0,a)$  (25 mark)

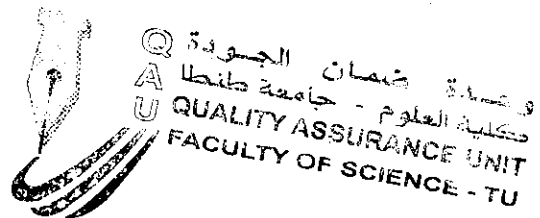
3-a-Determine the optimal order quantity for the discrete probabilistic inventory model . (25 mark )

-b-. For SISS inventory model , by using a geometric programming approach. Determine optimal order quantity for the following :


$TC = OC + HC + PC$  Subject to:  $OC \leq k_1, HC \leq k_2$  (25 mark)

أطيب الأمنيات بالتوفيق والنجاح.

Dr. Hala Ali Fergany	Dr. Neama Salha	EXAMINERS
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	TANTA UNIVERSITY - FACULTY OF SCIENCE - MATHEMATICS DEPARTMENT		
	EXAMINATION FOR THIRD LEVEL (STATISTICS)		
	COURSE TITLE: Design of Experiments (ST3103)		
DATE: 16 <sup>th</sup> January 2017	TERM: First	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 Hours

**Answer the following questions:** (consider  $\alpha = 0.05$  in all questions)

1- We have five different machines making the same pins and we take five random samples from each machine to obtain the following pins diameter data:

M1	M2	M3	M4	M5
0.125	0.118	0.123	0.126	0.118
0.127	0.122	0.125	0.128	0.129
0.125	0.120	0.125	0.126	0.127
0.126	0.124	0.124	0.127	0.120
0.128	0.119	0.126	0.129	0.121

Test if there are any differences in pins diameters.

2- An experiment was conducted to investigate the effects of three different diets on the growth of rats. There were five different litters of rats used in the experiments. From each litter, one rat was assigned to each of the three diets. The weights gains over a fortnight's period are summarized in the table below.


Litter	Diet A	Diet B	Diet C
	1	1.58	1.47
2	1.54	1.61	1.48
3	1.50	1.31	1.25
4	1.42	1.50	1.07
5	1.52	1.67	1.59

Determine whether there are significant difference (i) between the litters (ii) between the diets.

3- The maximum output voltage of a particular type of storage battery is thought to be influenced by the material used in the plates and the temperature in the location at which the battery is installed. Four blocks of the experiment are run in the laboratory for three materials (M) and two temperature (T), and the results are as below

Blocks	I	T <sub>2</sub> M <sub>2</sub> (19)	T <sub>2</sub> M <sub>1</sub> (34)	T <sub>1</sub> M <sub>1</sub> (30)	T <sub>2</sub> M <sub>3</sub> (44)	T <sub>1</sub> M <sub>3</sub> (40)	T <sub>1</sub> M <sub>2</sub> (26)
II	T <sub>2</sub> M <sub>1</sub> (24)	T <sub>2</sub> M <sub>2</sub> (22)	T <sub>2</sub> M <sub>3</sub> (20)	T <sub>1</sub> M <sub>2</sub> (33)	T <sub>1</sub> M <sub>1</sub> (45)	T <sub>1</sub> M <sub>3</sub> (31)	
III	T <sub>1</sub> M <sub>2</sub> (18)	T <sub>1</sub> M <sub>1</sub> (23)	T <sub>2</sub> M <sub>1</sub> (41)	T <sub>1</sub> M <sub>3</sub> (30)	T <sub>2</sub> M <sub>3</sub> (41)	T <sub>2</sub> M <sub>2</sub> (34)	
IV	T <sub>1</sub> M <sub>3</sub> (29)	T <sub>2</sub> M <sub>2</sub> (15)	T <sub>2</sub> M <sub>3</sub> (15)	T <sub>2</sub> M <sub>1</sub> (75)	T <sub>1</sub> M <sub>2</sub> (42)	T <sub>1</sub> M <sub>1</sub> (70)	

Analyze the previous data using a suitable design.

 1969	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS		
	Final Exam, 1 <sup>st</sup> Term, 2016-2017		
	3 <sup>rd</sup> year, Statistics	Course Title: Correlation Theory(1)	Course Code: ST3101
	Date: 2-1-2017	Total Mark: 150 Marks	Time Allowed: 2 Hours

**Answer all the following questions**

**Question 1** For the following data.

Age (years) of Husband	Age (years) of wife				
	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
15 - 25	5	3			
25 - 35		15	14		
35 - 45	3	11	11	7	
45 - 55			7	12	3
55 - 65				3	6

Calculate: correlation coefficient ( $r$ ) - standard deviation of  $X$  ( $s_X$ ) - standard error of  $X$  on  $Y$  ( $s_{X.Y}$ ).

**Question 2**

(1) Show that the linear correlation coefficient is given by

$$r = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{[N \sum X^2 - (\sum X)^2][N \sum Y^2 - (\sum Y)^2]}}$$

(2) If the regression lines of  $Y$  on  $X$  is given by  $Y = a_0 + a_1X$ , and of  $X$  on  $Y$  is given by  $X = b_0 + b_1Y$ , prove that  $a_1b_1 = r^2$ .

**Question 3**

(1) Show that the least-squares regression line of  $Y$  on  $X$  can be written as

$$y = \left( \frac{\sum xy}{\sum x^2} \right) x,$$

where  $x = X - \bar{X}$  and  $y = Y - \bar{Y}$ .

(2) Explain the difference between the standard deviation of a variable  $Y$  and standard error of estimate of regression line of  $Y$  on  $X$ .

**Question 4**

(1) Prove the following relation

$$\frac{x_1}{s_1} = \left( \frac{r_{12} - r_{13}r_{23}}{1 - r_{23}^2} \right) \frac{x_2}{s_2} + \left( \frac{r_{13} - r_{12}r_{23}}{1 - r_{23}^2} \right) \frac{x_3}{s_3}$$

(2) Explain in brief tests of hypothesis for the population linear correlation coefficient.

Examiners:	Dr. HASAN BAKOUSH & Dr. NEAMA TEMRAZ
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