



Answer the Following Questions:

الاختبار من ٤ ورقات

These figures are required for Questions

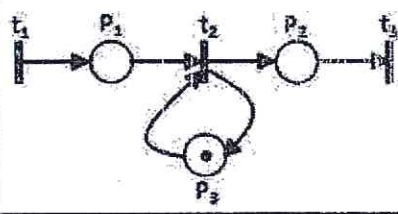


Fig. 1

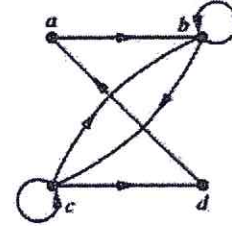


Fig. 2

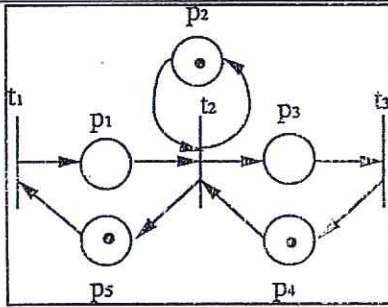


Fig. 3

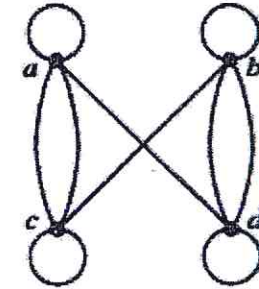


Fig. 4

QUESTION 1: [Total marks: 36]

1. Discuss the safeness of PN of Fig. 1 and if it is not satisfied make suitable modifications to convert it to be safe PN. (10 marks)
2. For the graph of Fig. 2 find **walk, trail, path, circuit, and cycle**. (10 marks)
3. Define the algorithm and the three ways used to represent the algorithm. (6 marks)
4. Rearrange, in ascending order, the array $A = \langle 75, 18, 40, 5, 10, 65, 5, 14, 15, 3, 11 \rangle$ using the insertion sort algorithm. (10 marks)

QUESTION 2: [Total marks: 40]

1. Draw the graph represented by the following adjacency matrix and determine its type. (7 marks)

$$\begin{matrix}
 & a & b & c & d \\
 a & 1 & 1 & 1 & 1 \\
 b & 0 & 0 & 0 & 1 \\
 c & 1 & 1 & 0 & 0 \\
 d & 0 & 1 & 1 & 1
 \end{matrix}$$

2. Define the following: Petri net structure, Petri net graph, enabling rule, and firing rule. (8 marks)
3. For the graph of Fig. 4 find: (10 marks)
 - a. Adjacency matrix.
 - b. Incidence matrix.

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4. Consider the PN of Fig. 3: (15 marks)
- Find reachability graph, RS, and sequence of firing of transitions
 - Discuss the deadlock for it.
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QUESTION 3: [Total marks: 54]

Choose the best answer for each of the following points.

- In Petri nets, the tokens are represented by:
 - Arrows.
 - Bars.
 - Circles.
 - Small dots
- Adjacency matrix of a graph with n vertices is based on the ordering of these vertices. So, there are:
 - $n!$ different adjacency matrices.
 - 2^n different adjacency matrices.
 - n^2 different adjacency matrices.
 - n different adjacency matrices.
- Multiple edges are represented in the incidence matrix using:
 - Rows with entries that are all zeros.
 - Columns with identical entries.
 - Columns with entries that are all zeros.
 - Rows with identical entries.
- The size of a graph is the number of:
 - Edges.
 - Vertices.
 - Subgraphs.
 - Components.
- The RAM model contains instructions that takes a constant amount of time such as:
 - Arithmetic.
 - Data movement.
 - Control.
 - All the above.
- A graph $G = (V, E)$ with $V = \emptyset$ is called:
 - Null graph.
 - Trivial graph.
 - Empty graph.
 - Multi graph.
- If the two vertices u and v are endpoints of an edge e , then they called:
 - Parallel.
 - Isolated.
 - Pendant.
 - Adjacent.
- The edges that have the same end vertices are called:
 - Parallel.
 - Isolated.
 - Pendant.
 - Adjacent.
- Multiple edges connecting the same pair of vertices v_i and v_j , or multiple loops at the same vertex make the adjacency matrix:
 - Not zero-one matrix.
 - Zero-one matrix
 - Contain no zeros.
 - contain no ones.
- Adjacency matrix can represent:
 - Simple undirected graph only.
 - Multigraph permitting loops only.
 - Digraph only.
 - All the above.
- In Petri nets, the places are represented by:
 - Arrows.
 - Bars.
 - Circles.
 - Small dots

12. Diagonal of adjacency matrix is all 0, in zero-one matrix, if the graph is:
- A. Simple with loops. B. Simple with no loops.
 B. Multigraph permitting loops. D. All the above.
13. Non-zero entries in the diagonal of adjacency matrix mean that the graph:
- A. Has not loop B. has parallel edges. C. Has loops. D. has not edges.
14. In analyzing algorithm when we consider the case that the maximum number of steps taken on any instance of size n , then the case called:
- A. Best case. B. Average case. C. Worst case. D. None of the above.
15. A graph $G = (V, E)$ with $|V| = 1$ is called:
- A. Null graph. B. Trivial graph. C. Empty graph. D. Multi graph.
16. The RAM model contains instructions that represent a gray area in RAM such as:
- A. Shift left. B. Data movement. C. Control. D. All the above.
17. In Petri nets, the arcs are represented by:
- A. Arrows. B. Bars. C. Circles. D. Small dots
18. Which of the following is true about tokens?
- I. They used to indicate which places are active.
 II. They are represented by small dot in the places.
 III. Their number and their distribution determine the dynamic behavior of a Petri net.
- A. I and II only. B. I and III only. C. II and III only. D. I, II, and III.
19. W_n , for $n \geq 3$, can be obtained by adding an additional vertex to:
- A. C_n and connect this new vertex to each of the n vertices in C_n by new edges.
 B. K_n and connect this new vertex to each of the n vertices in K_n by new edges.
 C. Q_n and connect this new vertex to each of the n vertices in Q_n by new edges.
 D. None of the above
20. The RAM model contains instructions that represent a gray area in RAM such as:
- A. Exponentiation. B. Data movement. C. Control. D. All the above.
21. Loops are represented in incidence matrix using:
- A. Diagonal with ones in some entries.
 B. Diagonal with zeros in some entries.
 C. A column with exactly one entry equal to 1.
 D. A column with entries that are all zeros.
22. A graph $G = (V, E)$ with $E = \emptyset$ is called:
- A. Null graph. B. Trivial graph. C. Empty graph. D. Multi graph.

23. The edges that share a common end vertex are called:
 A. Parallel. B. Isolated. C. Pendant. D. Adjacent.
24. The vertex whose degree is 1 is called:
 A. Trivial. B. Isolated. C. Pendant. D. Adjacent.
25. The vertex whose degree is 0 is called:
 A. Trivial. B. Isolated. C. Pendant. D. Adjacent.
26. The order of a graph is the number of:
 A. Edges. B. Vertices. C. Subgraphs. D. Components.
27. In Petri nets, the transitions are represented by:
 A. Arrows. B. Bars. C. Circles. D. Small dots

QUESTION 4: [Total marks: 20]

For each of the following sentences, determine whether it is true or false:

1. In an undirected simple graph of order n , the maximum degree of each vertex is $n - 1$ and the maximum size of the graph is $(n - 1)/2$.
2. Adjacency matrix of graph G is based on the ordering chosen for the vertices, so it is not unique.
3. Adjacency matrix of all undirected graphs is not necessarily symmetric.
4. The adjacency matrix for a directed graph does not have to be symmetric.
5. In Petri nets, arcs are allowed to connect two places or two transitions.
6. Running time of an algorithm is the number of primitive operations or steps executed.
7. An arc in Petri net always connects two places to a transition in either direction.
8. Analyzing an algorithm means predicting the resources that the algorithm requires such as memory and running time.
9. There is no upper limit to the number of arcs that can connect to a place or a transition.
10. In Q_n , two vertices are adjacent if and only if the bit strings that they represent differ in exactly one-bit position.

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End of examination

EXAMINERS	DR. MOUSAAD WAGEH HASSAN	PRF.
	DR.	DR/

With best wishes



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Tanta University
Faculty of Science

Department of Mathematics

Final term exam for the summer semester 2022-2023

Course title:

Operations Research (1)

Course code: MA3103

Date: 5/1/2023

Total Marks: 150

Time allowed: 2 Hours

Answer all the following questions:**First question:**

- (a) Prove that if a L.P.P. has at least two optimal feasible solutions, then there are infinite number of optimal solutions.
- (b) Prove that the sum $S = S_1 + S_2$ of two convex sets S_1, S_2 in R^n is a convex set.
- (c) Show that the set $S = \{x : x = (x_1, x_2) : x_1 \geq 2, x_2 \leq 4\} \subset R^2$ is convex set?.

Second question:

- (a) Solve graphically the following LPP:

$$\max z = 2x_1 + 3x_2 \text{ s.t. } 3x_1 + x_2 \leq 1, 3x_1 + x_2 \leq 10, x_1, x_2 \geq 0$$

- (b) By Simplex method solve the following LPP:

$$\max z = x_1 - x_2 + 3x_3$$

$$\text{s.t. } x_1 + x_2 + x_3 \leq 10; 2x_1 - x_3 \leq 3; 2x_1 - 2x_2 + 3x_3 \leq 0; x_1, x_2, x_3 \geq 0.$$

Third question:

- (a) State and prove the weak Duality theorem?
- (b) Find the dual of the following L.P.P.

$$\min z = x_1 + x_2 + x_3 \text{ subject to}$$

$$x_1 - 3x_2 + 4x_3 = 5, x_1 - 2x_2 \leq 3, 2x_2 - x_3 \geq 4, x_1, x_2 \geq 0, x_3 \text{ is unrestricted in sign}$$

Fourth question:

- (a) Write a short note on "Transportation problem"
- (b) Determine an initial basic feasible solution to the following transportation problem using Vogel's approximation method (VAM).


	d_1	d_2	d_3	
S_1	x_{11} 2	x_{12} 7	x_{13} 4	5
S_2	x_{21} 3	x_{22} 3	x_{23} 1	8
S_3	x_{31} 5	x_{32} 4	x_{33} 7	7
S_4	x_{41} 1	x_{42} 6	x_{43} 2	14
	7	9	18	

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(c) Solve the following game to find the saddle point.

		Player B				
		b_1	b_2	b_3	b_4	b_5
Player A	a_1	4	0	1	7	-1
	a_2	0	-3	-5	-6	5
	a_3	3	2	2	4	3
	a_4	-6	1	-2	0	-5

Examiner:	Dr. N. El-Kholy
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	Tanta University-Faculty of Science			
	Department of Mathematics			
	Final examination paper (third level) of Statistics			
Course Title:	Correlation Theory نظريه الارتباط ١		Course Code: ST3101	
Date:	22-Jan-2023	First semester	Marks: 150	Time Allowed: 2 hours

Question 1. (25 marks)

Find r_{pb} between the answering of (equation 5) on an exam where “correct=1” and “incorrect=0” and the score of this exam for (10) students according to the following table:

Test score	90	85	78	93	89	79	79	75	90	79
Item 5 performance	1	1	0	1	1	0	1	0	1	0

Question 2. (25 marks)

A random variable Y is generated from the normally distributed random variable X by $Y = -5X + 3$, determine population correlation coefficient.

Question 3. (45 marks)

The variables X and Y presented in the following table.

X	1	2	3	4	5
Y	2	3	5	6	8

1. Find the regression equation of Y on X.
2. Find the coefficient of linear correlation between X and Y.
3. Compute the standard error estimate $S_{Y.X}$.
4. Find the total variation.
5. Find 95% confidence interval of the slope of the regression line and for the intersection.
6. Test the significance of the regression line of Y on X using level of significance 0.05 ($t_{3,0.025} = 3.182$).

Question 4. (30 marks)

Prove that for linear regression coefficient between the variables X and Y can be written

$$r = \frac{\sum xy}{\sqrt{(\sum x^2)(\sum y^2)}}$$


Where $x = X - \bar{X}$, $y = Y - \bar{Y}$

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Question 5. (25 marks)

Find r_ϕ between gender (male/ female) and depression (infected/ not infected) according to the table.

Gen \ Dep	Infected	Not infected
Male	12	8
Female	4	6

	Tanta University-Faculty of Science			
	Department of Mathematics			
	Final examination paper (third level) of Statistics			
Course Title:	Experimental Design تصميم تجارب		Course Code: ST3103	
Date:	15-January-2023	First semester	Marks: 150	Time Allowed: 2 hours

Question 1. (25 marks)

- In short statement, define Treatments and Blocks in an experiment such that you show the difference between them.
- Show diagram example for an experiment with and without blocks.
- In short description, show the difference between one-way ANOVA, two-way ANOVA, Latin Square Design, and factorial design.

Question 2. (30 marks)

Write Mathematica code including the data entry to solve the following problem:

The following data set is for an experiment that involves two levels of temperature and three levels of material. Investigate if there is a difference in temperature levels or not, same for material. Check if there is an interaction between temperature and material?

I	T_2M_2 19	T_2M_1 34	T_1M_1 30	T_2M_3 44	T_1M_3 40	T_1M_2 26
II	T_2M_1 24	T_2M_2 22	T_2M_3 20	T_1M_2 33	T_1M_1 45	T_1M_3 31
III	T_1M_2 18	T_1M_1 23	T_2M_1 41	T_1M_3 30	T_2M_3 41	T_2M_2 34
IV	T_1M_3 29	T_2M_2 15	T_2M_3 15	T_2M_1 75	T_1M_2 42	T_1M_1 70

Question 3. (25 marks)

Write the Anova table with formulas in the nested design with 4 treatments and 2 blocks, each block has 3 units.

Question 4. (35 marks)

An engineer tests 3 plate materials for a new battery at 3 temperature levels (15, 70 125). Four batteries (replicates) are tested at each combination of plate material and temperature, and all 36 tests are run in random order. What effects do material type and temperature have on the life of a battery? Is there a material that would give long life regardless of temperature? $F_{0.05,2,27} = 3.354$ and $F_{0.05,4,27} = 2.728$

Table 5-4 Life Data (in hours) for the Battery Design Experiment

Material Type	Temperature (°F)					
	15		70		125	
1	130	155	34	40	20	70
	74	180	80	75	82	58
2	150	188	136	122	25	70
	159	126	106	115	58	45
3	138	110	174	120	96	104
	168	160	150	139	82	60

Please turn the sheet for Question 5

Question 5. (35 marks)

It has been suggested that the brand of petrol is important in the calculation of average fuel consumption. To test this idea, five fuels R, C, H, F and J were tested. The experiment used five cars: Rover, Citoen, Hyundai, Ford and Jaguar. Each car was driven at a steady speed around an oval track. The cars were filled with 1 gallon of fuel and were driven until the fuel run out. The distances were recorded as follows:

R 90	C 47	H 60	F 79	J 50
R 68	C 63	H 65	F 74	J 46
R 68	C 63	H 83	F 74	J 46
R 61	C 62	H 94	F 65	J 58
R 87	C 60	H 51	F 76	J 61

- Construct the basic Latin square and derive 5 different squares from it.
- Use the Latin square to test whether there are significant differences between the distances.

Tabulated values

$$F_{0.05,2,27} = 3.354 \quad F_{0.05,4,27} = 2.728$$

$$F_{0.05,4,12} = 5.912$$

Best wishes & good luck

Examiner: Dr. Ahmed Abozaid Elbanna



TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS

EXAMINATION FOR (THIRD YEAR) STUDENTS OF MATHEMATICAL STATISTICS

COURSE TITLE:	Inventory System	COURSE CODE: ST3105
TIME ALLOWED: 2 HOURS	TOTAL ASSESSMENT MARKS: 150	TERM: 1
		27-12-2022

Answer the following questions

1) – Calculate the optimal order quantities 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)

2) - For SISS inventory model determine the optimal order quantity with linear constraint using Lagrange multiplier approach.

(25 mark)

3) - Evaluate the optimal order quantity of the classical penalty inventory model.

(25 mark)

4) - Determine the optimal order quantity for the discrete probabilistic inventory model with the expected total cost given by: $E [TC]= E[HC]+E[SC]$,

(25 mark)

5) - Determine the optimal order quantity for the single period uniform demand probabilistic inventory model and when the demand is random variable follows the exponential distribution .

(25 mark)

6) - Find 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 the model.

(25 mark)

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Dr. Hala Fergany