

Differential Geometry (25 marks)

Answer Two questions only: -

1- Prove that the locus of the centers of osculating sphere at any point on the Helix its angle (θ) , also is a Helix its angle is $(\frac{\pi}{2} - \theta)$, and find the necessary and sufficient condition for the curve to be lie on a sphere. **(12.5 marks)**

2- (a) Determine the torsion $\tau(u)$ of the curve given by:

$$\underline{r} = \{a(u - \sin u), a(1 - \cos u), bu\}$$

Prove that: $\tau(0)\tau\left(\frac{\pi}{2}\right)(a^2 + b^2) = 1$ **(6.5 marks)**

(b) Find the equation of the involute of the circle

$$\underline{r} = a \cos \theta \underline{e}_1 + a \sin \theta \underline{e}_2, \quad a > 0 \quad \textbf{(6 marks)}$$

3- (a) Prove that any regular space curve is completely determined to its position by its curvature function $\kappa = \kappa(s) > 0$ and its torsion $\tau = \tau(s)$ (s-arc length parameter) **(6.5 marks)**

(b) Determine the intrinsic equation of the curve

$$\underline{X} = b \cosh\left(\frac{t}{b}\right) \underline{e}_1 + t \underline{e}_2, \quad (b \text{ constant}) \quad \textbf{(6 marks)}$$

With my best wishes,,,,,,,,,,,,,

Dr. Rawya Abdel Rahman Hussein



Final Exam
Topology and Differential Geometry
Cod: 421 M
Time: 2 hours
Grade: 50 marks

Department of Mathematics
Faculty of Sciences
Assiut University
2024-2025
12-1-2025

Topology(25 marks).

Three degrees for each of the following three questions

- 1- Prove that $\tau = \{\phi, U \subseteq X : p \in U \text{ or } q \in U, x, y \in X, x \neq y\}$ is not topology on a non-empty X .
- 2- Prove that $\overline{(A \cup B)} = \overline{A} \cup \overline{B} \quad \forall A, B \in X$.
- 3- If $X = \{a, b, c, d, e\}$, Prove that $\tau = \{\phi, U \subseteq X : \{a, b\} \subseteq U\}$ is a topology on X and find A° and A' for $A = \{b, d, e\}$.

Choose the correct answer from those given [two degrees for each point]:

- 4- If (X, I) is an indiscrete space and $A \subseteq X$, where $A^\circ = \phi$ and $A' = A^c$, then
(a) $A = X$ (b) $A = \phi$ (c) A is singleton
- 5- If (X, τ) is a topological space, $A \subseteq X$, where $A^\circ = \overline{A}$ and $A' = \phi$, then
(a) $\tau = D$ (b) $\tau = I$ (c) $\tau = C$
- 6- If (X, ζ) is an excluding point space $p \notin A \subseteq X$, then $\overline{A}$ is (a) X (b) A (c) $A \cup \{p\}$
- 7- For a particular space (X, P) , and a proper subset $A \subset X$, $p \notin A \Rightarrow b(A)$ is
(a) A (b) X (c) A^c

Choose True for a correct answer or False otherwise [two degrees for each point].

- 8- If (X, D) is a discrete space and $A \subseteq X$, then $\overline{A} = A^\circ = A'$. (a) True (b) False
- 9- If (X, τ) is a topological space and $A, B \subseteq X$, then $\text{ext}(A \cap B) = \text{ext}(A) \cap \text{ext}(B)$.
(a) True (b) False
- 10- If (X, τ) is a topological space and $A, B \subseteq X$, then $(A \cup B)^\circ = A^\circ \cup B^\circ$.
(a) True (b) False
- 11- $\beta = \{\{p, q\} \mid \forall q \in X\}$ is a base for a particular point space (X, P) .
(a) True (b) False

Please look the rest of questions



Assiut University - Faculty of Science

406 Cement Making (First term exam)

Time: 2 hours - Marks: 50 marks

9-1-2025



(Q. 10) Write short notes on control parameters for kiln operation, and quality control parameters for produced clinker (8 marks)



Assiut University - Faculty of Science

406 Cement Making (First term exam)

Time: 2 hours - Marks: 50 marks

9-1-2025



(Q. 8) Write short notes on alternative fuel types, evaluation parameters, and quality parameters (6 marks)

(Q. 9) Compare between vertical and ball mill in terms of the below items (6 marks)

Item	Ball mill	Vertical mill
Usage		
Feed Size		
Max. Moisture		
Production rate		
Material bed		
Replacement cost		



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406 Cement Making (First term exam)

Time: 2 hours - Marks: 50 marks

9-1-2025



(Q. 7) Write Short notes on types of calciner and clinker kiln components plus the benefits for each part (6 marks)



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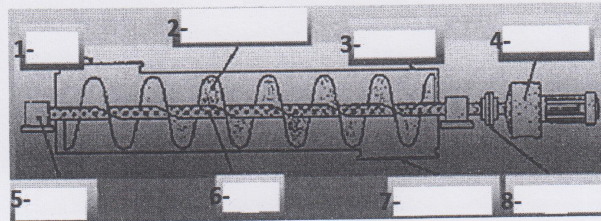
406 Cement Making (First term exam)

Time: 2 hours - Marks: 50 marks

9-1-2025



(Q. 4) Complete the required identification for each item on the picture (4 marks)



(Q. 5) Write the objectives of the pre-calcliner in the Pyro-process (3 marks)

1-

2-

3-

4-

5-

6-

(Q. 6) Write the types of liner used in the mill and usages for each one (2 marks)



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406 Cement Making (First term exam)

Time: 2 hours - Marks: 50 marks

9-1-2025



(Q. 2) Complete the sentences (5 marks)

- 1- Mill ventilation has **three** main functions which are ,
..... , and
- 2- The degree of homogeneity in the silo depend on
- 3- Clinker ring is formed due to a lot of factors such as ,
..... , and
- 4- The aim of raw mix grinding is , ,
- 5- The main difference between the cement mill & raw mill are ,
and

(Q. 3) Mark true or false for the below sentences, and give reasons for the false ones (5 marks)

- 1- In the Crossbar cooler, the mechanical air flow regulator regulates airflow according to the clinker bed. ()
- 2- The Cr % is higher in the liner than the ball to avoid deformation. ()
- 3- Dust clinker ring is formed due to volatiles. ()
- 4- Chlorides are condensed at a temperature lower than Sulfur ()
- 5- The dynamic separator reduced energy consumption and achieved uniform product quality. ()



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406 Cement Making (First term exam)

Time: 2 hours - Marks: 50 marks

9-1-2025



(Q. 1) Choose the correct answer: (5 marks)

- 1- The cement material is mainly considered as
 - A. Hydraulic binder
 - B. Inorganic matter
 - C. Activation substance
 - D. A & B
- 2- Mechanical load in the kiln system caused by
 - A. Mechanical part
 - B. Clinker modules
 - C. Overheating
 - D. A & B
- 3- Which of the following phases is responsible for the short-term strength
 - A. C3S
 - B. C2S
 - C. C3A
 - D. C4AF
- 4- In the cement mill there is a diaphragm which controls
 - A. Coating
 - B. Material level
 - C. Material size entering 2nd compartment
 - D. B & C
- 5- The filling degree of the screw conveyer depends on
 - A. Conveyer diameter
 - B. Maximum material size
 - C. Maximum rpm
 - D. All the above

----- End of Questions with My Best Wishes for Success -----

Question No. 3:

(20 marks)

Answer the following questions:

(5 marks for each question)

- (i) Discuss the key differences between sequence and structure databases? Provide examples of each type?
- (ii) What are the five types of BLAST programs and their primary uses?
- (iii) Define sequence alignment and explain its importance in bioinformatics. Why is it essential to compare sequences, and what insights can be gained from sequence alignment.
- (iv) Explain the process and statistical tasks performed by the FASTA program when aligning pairs of protein or DNA sequences?

14. Function of a protein turned out to be a direct consequence of its -----

- a) 3-D structure
- b) Secondary structure
- c) Amino acids sequences
- d) None of previous

15. What is the first step in the FASTA algorithm?

- a) Global alignment of sequences
- b) Identifying regions of similarity using k-tuple words
- c) Using dynamic programming for alignment
- d) Calculating statistical significance of matches

Question No. 1 answers

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer															

Question No. 2: *Determine whether of these statements are true (T) or false (F)* (15 marks)

1. Secondary databases rely entirely on the data submitted to them by researchers.
2. SCOP and CATH classify protein structural domains based on evolutionary relationships and structural folds.
3. Dynamic programming methods require more computational time than heuristic methods.
4. Word or k-tuple methods are designed to improve the speed of sequence alignment.
5. The probability of random matches in a database search decreases with the size of the database.
6. Orthologous genes are found in the same genome and arise from duplication events.
7. High E-values in a BLAST result indicate that the alignment is highly significant.
8. The goals of BLAST and FASTA are the same, but their algorithms differ significantly.
9. The yeast two-hybrid (Y2H) method is an in vitro technique for detecting protein-protein interactions.
10. Functional interactions always involve direct physical contact between proteins.
11. Transient interactions are typically involved in signaling pathways.
12. In local alignment, only the regions with the highest density of matches are aligned.
13. STRING is a database and tool used for analyzing metabolic pathways.
14. ExPASy is an open-access resource, and most tools and databases can be accessed freely without a subscription.
15. Gap penalties in sequence alignment are used to penalize matches between sequences.

Question No. 2 answers

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer															



- Important** • No. of pages: 4 – Solution on the same paper.
Remark • Put your answers in the table

Question No. 1: Choose the correct answer (15 marks)

1. Which database is considered a primary database for protein structures?
a) Swiss-Prot b) PDB c) GenBank d) PFam
2. Which of these databases focuses on classification of protein structural domains?
a) CATH b) UniProt c) GenBank d) SCOP
3. Which algorithm is commonly used for global sequence alignment?
a) BLAST b) FASTA c) Smith-Waterman d) Needleman-Wunsch
4. A protein interaction where the individual components are stable and functional on their own is classified as -----
a) Obligate b) Permanent c) Non-obligate d) Homo-oligomeric
5. What type of information is stored in the DDBJ database?
a) Protein family classifications b) Raw nucleotide sequences
c) Protein 3D structures d) Metabolic pathways and enzymes
6. What is the quaternary structure of a protein?
a) 3D shape b) Amino acid sequence
c) Beta sheets and alpha helices d) Multiple polypeptide chains
7. What is RasMol primarily used for?
a) DNA sequence alignment b) Visualization of molecular structures
c) Predicting protein sequences d) Analyzing metabolic pathways
8. Which type of database typically contains more sequences?
a) DNA databases b) Protein databases
c) Both are equal in size d) unannotated Protein databases
9. In BLAST, what is a "hit"?
a) A gap in the alignment b) A match found in the database
c) A mismatched base pair d) An error in the alignment process
10. Which scoring system is commonly used in sequence alignment to assess the quality of an alignment?
a) PAM and BLOSUM matrices b) Dot matrix analysis
c) Euler's method d) Fourier transform
11. High-throughput PPIs detection include -----
a) Nuclear magnetic resonance b) X-Ray Crystallography
c) Structure-based approaches d) Yeast Two-Hybrid
12. Studying PPIs is becoming one of the major objectives of system biology to -----
a) Predicting protein function b) Decode molecular mechanism
c) Enhance of drug discovery d) All of previous
13. Which symbol is used to denote the beginning of a header line in a FASTA file?
a) \$ b) # c) > d) &

4. In Euler's method, if the step size is too large, accuracy suffers; if too small, computational cost increases unnecessarily.

5. dsolve is part of the Symbolic Math Toolbox, whereas ode45 is built in.

6. MATLAB command for $y = 3(\cos x + 2)$ when $x = 2$ is

>> x=2;
>> y=3*(cos x+2)

7. Predictor-corrector methods are self-starting methods.

8. Adam's method needs to know at least three initial values of the required function

9. The methods of Taylor, Euler and Runge-kutta are called one-step methods for

solving nonlinear equations.

10. A correct expected value characterizes modified Euler and Milne methods.

Question No. 3: Answer the following questions

(25 marks)

1. The following data shows the sales (in million dollars) of a company.

(10 marks)

X	2015	2016	2017	2018	2019
Y	12	19	29	37	45

Estimate the sales in the year 2020 using the regression line?

2. Use MATLAB program to perform the following:

a) Write a MATLAB function to solve the following system of ordinary differential equation over the interval $0 \leq t \leq 5$ using numerical methods. (10 marks)

$$\begin{aligned}\frac{ds}{dt} &= -0.3SI, & S(0) &= 0.99 \\ \frac{dI}{dt} &= 0.3SI - 0.75I, & I(0) &= 0.01 \\ \frac{dR}{dt} &= 0.75I, & R(0) &= 0\end{aligned}$$

b) Calculate an exact symbolic solution for the ordinary differential equation $y'(x) + 2y = 12 \sin(4t)$, $y(0) = 10$ (5 marks)

-----End of Questions with my Best Wishes for Success-----

8. The step size h in numerical methods for ODEs is chosen to:
 - a) Minimize computational cost
 - b) Ensure the solution is exact
 - c) Balance accuracy and stability
 - d) Make the problem non-stiff
9. The equation described by the least squares method typically includes:
 - a) A single variable
 - b) A function to minimize errors
 - c) A fixed value for all datasets
 - d) No parameters
10. Which of the following MATLAB functions is used to solve stiff ODEs numerically?
 - a) ode45
 - b) ode23
 - c) ode15s
 - d) dsolve
11. In MATLAB, which command is used to define a symbolic ODE?
 - a) sym
 - b) ode45
 - c) dsolve
 - d) diff
12. What is the output of y in the following statements
 $\gg y = ['4'...$
 $'+5']$
 - a) 45
 - b) 9
 - c) 4+5
 - d) error
13. The while end loop will complete repetitions
 - a) until a logic statement is false
 - b) until a logic statement is true
 - c) until a counter has expired
 - d) indefinitely
14. In Euler's method for solving the initial value problem $y'(x) = f(x, y)$, the value of y at the next step is given by:
 - a) $y_{n+1} = y_n + h f(x_n, y_n)$
 - b) $y_{n+1} = y_n + h f(x_n, y_{n+1})$
 - c) $y_{n+1} = y_n + (h/2)f(x_n, y_n)$
 - d) $y_{n+1} = y_n - h f(x_n, y_n)$
15. Which of the following methods uses the formula

$$y_{n+1} = y_{n-3} + \frac{4h}{3}(2f_{n-2} - f_{n-1} + 2f_n)$$
 - a) Euler's Method
 - b) Runge-Kutta Method
 - c) Adams Method
 - d) Milne Method

Question No. 2: Determine whether of these statements are true (T) or false (F) (10 marks)

1. In multi-step methods, estimates of the solution at a particular step are entirely based on information from more than one step.
2. The least squares method minimizes the sum of absolute distances between data points and a curve.
3. The least squares method is reliable for all types of data.



Faculty of Science
1st Semester 2024 – 2025
Date: 22/1/2025
Marks: (50)

Mathematics final exam

Department of Mathematics
Scientific Computations 1
(451MC)- 4th level
Time: (2 hours)



Important • No. of pages: 3

Question No. 1: Choose the correct answer

(15 marks)

➤ The following MATLAB code uses the Runge Kutta of order two to solve the differential equation $y'(x) = x^2 - y$, $y(0) = 1$ on the interval $x = [0, 0.5]$ with step size $h = 0.05$. Answer the following questions numbered 1-5.

1. The Runge-Kutta method of order 2 is classified as:

- a) One-step method
- b) Multistep method
- c) Midpoint method
- d) Predictor-corrector method

2. The appropriate formula in the position labeled ①

- a) $n = (b-a)/2$
- b) $n = (b-a)/h$
- c) $n = (b-a)*h$
- d) $h = (b-a)/n$

3. In the position ②, The correct formula to compute the solution at the next step.....

- a) $y(i+1) = y(i) + (0.5)(k1+k2)$
- b) $y(i+1) = y(i) + (0.5)*(k1+k2)$
- c) $y(i+1) = y(i) + (0.5)*(k1+k2/2)$
- d) $y(i+1) = y(i) + (0.05)*(k1+k2)$

4. Which of the following expressions is valid in place number ③?

- a) $x(i+1) = x0 + (i+1)h$
- b) $x(i+1) = x0 + x(i)h$
- c) $x(i+1) = x(i) + h$
- d) $x(i+1) = x(i) + i*h$

5. What is the correct way to call the function in MATLAB?

- a) `[ x,y ] = rk2(0.5,(x^2-y),0,0.2,0,1)`
- b) `[ x,y ] = rk2(0.05,@(x,y)(x^2-y),0,0.5,0,1)`
- c) `[ x,y ] = rk(0.05,@(x,y)(x^2-y),0,0.2,0,1)`
- d) None of these

```
function [x,y] =rk2(h,fx,y,a,b,x0,y0)
.....①.....
x(1)=x0;
y(1)=y0;
for i=1:n
    k1=h*fx(x(i),y(i));
    k2=h*fx(x(i)+h,y(i)+k1);
    .....②.....
    .....③.....
end
end
```

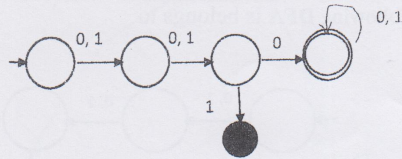
6. What is the primary goal of numerical methods for solving ordinary differential equations (ODEs)?

- a) Find Exact solutions
- b) Find Numerical approximations
- c) Stability analysis
- d) Simplification of equations

7. Which method is commonly used to initialize a multistep method?

- a) Predictor-Corrector
- b) Runge-Kutta Method
- c) Milne's Method
- d) None of these

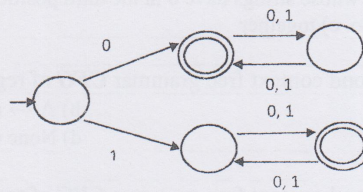
4. The correspond **RegExp**
of the following **DFA**



- a) $(0|1)(0|1)0(0|1)^*$
c) $(0|1)0(0|1)^*$

- b) $(0|1)(0|1)(0|1)0(0|1)^*$
d) $(0|1)(0|1)0(0|1)$

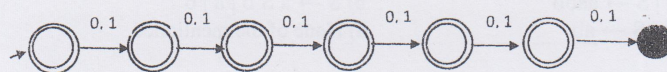
5. The correspond **RegExp**
of the following **DFA**



- a) $0((0|1)(0|1))^*|1(0|1)((0|1)(0|1))^*$
c) $1((0|1)(0|1))^*0(0|1)((0|1)(0|1))^*$

- b) $0((0|1)(0|1))^*|1((0|1)(0|1))^*$
d) $0((0|1)(0|1))^*|((0|1)(0|1))^*$

6. The following **DFA** is belongs to

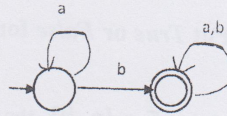


- a) the language whose string length less than 5 symbols
b) the language whose string length less than or equal 5 symbols
c) the language whose string greater than 5 symbols
d) the language whose string length greater than or equal 5 symbols

14. For the alphabet $\Sigma = \{a, bb\}$, $\Sigma^2 = \{aa, abb, bba, bbbb\}$.

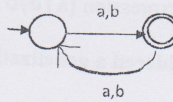
Question 2: Choose the correct answer (20 Marks)

1. The correspond **RegExp** of the following **DFA**



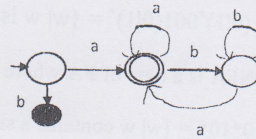
- a) $(a|b)^*b$
c) $a | b | a(a|b)^*a | b(a|b)^*b$

2. The correspond **RegExp** of the following **DFA**



- a) $a \mid b \mid a(a \mid b)^* a \mid b(a \mid b)^* b$ b) $a (a \mid b)^* a \mid b$
c) $((a \mid b)(a \mid b))^* (a \mid b)$ d) $(a \mid b)^* b(a \mid b)^*$

3. The correspond **RegExp** of the following **DFA**



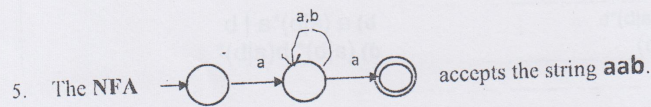
- a) a^*b
c) $a(a|b)^*a \mid b(a|b)^*b$

	Assiut University Faculty of Science Mathematics Dept.	Final Exam 2024-2025 Course: Computational Theory Course code: MC457	Level: Fourth Time: 2 Hours Mark: 50	
FREE PALESTINE				

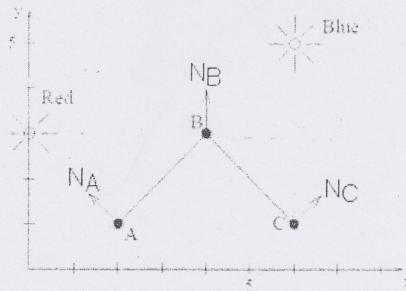
"اَسْتَعِزُّ بِاللّٰهِ وَلَا تَعْجِزْ"
الامتحان أربع (4) صفحات - بابل شيت

Question 1: Put True or False for each of the following items (30 Marks)

- For alphabet $\Sigma = \{a, b\}$, the regular expression for the language whose strings start with **a** and end with **b** is $a(a|b)^*(a|b)^*b$.
- The regular expression $a|ab^*$ accepts the string **aa**.
- The regular expression $(a|a)b$ accepts the string **b**.
- NFA is considered a generalization of DFA**



- $(0|1)^*001(0|1)^* = \{w \mid w \text{ is the substring } 001 \text{ only}\}$.
- NFA** is a type of **FA** where it has an arrow with the label λ .
- $0^*10^* = \{w \mid w \text{ contains a single } 1\}$
- $(0|1)^*1(0|1)^* = \{w \mid w \text{ has at most one } 1\}$.
- The regular expression for the language whose strings are of odd length is $((a|b)(a|b)(a|b))^*(a|b)$
- The context-free grammar for the language whose strings are odd length and the middle symbol is **0**, is $S \rightarrow \lambda \mid 0S0 \mid 0S1 \mid 1S0 \mid 1S1$
- Σ^* is infinite set.



C. (6 Marks)

```
glTexParameteri(GL_Texture_2D, GL_Texture_WRAP_S, GL_REPEAT);
glTexParameteri(GL_Texture_2D, GL_Texture_WRAP_T, GL_REPEAT);
glBegin(GL_POLYGON);
    glTexCoord2f(0.0, 0.0); glVertex3f(-1.0, -1.0, 0.0);
    glTexCoord2f(x, 0.0); glVertex3f(1.0, -1.0, 0.0);
    glTexCoord2f(x, y); glVertex3f(1.0, 1.0, 0.0);
    glTexCoord2f(0.0, y); glVertex3f(-1.0, 1.0, 0.0);
glEnd();
```

The output of executing the previous commands for $x=1.0$ and $y=1.0$ is shown in the following Figure.



Draw the output for the following values of x and y :

- (3 Marks) $x=2.0$ and $y=1.0$
- (3 Marks) $x=2.0$ and $y=2.0$

Eye = (2, 0, 0)
Center = (1, 0, 0)
Up = (0, 1, 0)

13. The normalized surface normal vector to the plane $x+2y+2z+4=0$ is
14. In OpenGL, lines color is set using OpenGL command.
15. In `glVertex2i()` command, 2 represents
16. The transformation matrix corresponding to the following OpenGL code segment is.....
`glRotatef(45.0, 0, 0, 1.0);`
`glRotatef(45.0, 0, 0, 1.0);`
17. The transformation matrix corresponding to the following OpenGL code segment is.....
`glScalef(2.0, -1.5, -3.0);`
`glRotatef(180.0, 0, 0, 1.0);`
18. The Modelview matrix after executing the following OpenGL code segment is.....:
`glMatrixMode(GL_MODELVIEW);`
`glLoadIdentity();`
`glScalef(-2.0, 2.0, 1.0);`
`glPushMatrix();`
`glTranslatef(-1.0f, -2.0f, -3.0f);`
`glRotatef(-90.0, 0, 0, 1.0);`
`glScalef(-1.0, 0.5, -0.5);`
`glPopMatrix();`
`glRotatef(90.0, 0, 0, 1.0);`
19. The process of removal of hidden surfaces is termed as

- B. (6 Marks) The figure below contains two positional light sources and three points in 2D. The left light source emits red diffuse light = (1.0, 0.1, 0.1). The right light emits blue diffuse light = (0.1, 0.1, 1.0). Given the normal vectors shown in the figure (which are all of unit length). Assume the constant attenuation=0, linear attenuation =1.0, quadratic attenuation=0, the spotlight effect=1, the material ambient = (0, 0, 0), the material emission=(0.0,0), the diffuse components of the material = (0.5,0.5,0.5), and the specular components of the material = (0, 0, 0) for the three points. Using the Phong reflection model, calculate the followings:
- (3 Marks) The normalized normal vector for the three labeled points.
 - (3 Marks) The attenuation factor for the three labeled points for each light source.



No. of pages: 2 - No. of questions:3

A. (38 Marks) Fill the blanks

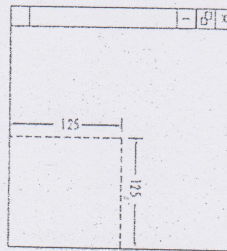
1. The number of triangles drawn if we use the drawing mode GL_TRIANGLE_STRIP with six vertices between glBegin(GL_TRIANGLE_STRIP) and glEnd() is
2. The frame buffer is a region of memory sufficiently large to hold all pixels of the display. The OpenGL command, clears a region in it which corresponds to the current display window.
3. The equation of the plane defined by the three points A=[1 2 -1], B=[4 2 3], and C=[1 4 -1] is
4. The RGB of a yellow color is
5. Rotating the 3D point (1,0,0) by -90 around z-axis gives
6. The 3x3 matrix for a translation by 2 in x and 3 in y is
7. The OpenGL code segment that generates the following transformation matrix is

$$\begin{bmatrix} -2 & 0 & 0 & 0 \\ 0 & 1.5 & 0 & 0 \\ 0 & 0 & -3 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

8. Write the following transformation matrix as a one dimensional 16-entry array used in OpenGL

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 3 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

9. The OpenGL code segment that sets the output to the following square is



10. Write the correct order of operations of the OpenGL graphics pipeline
11. Rotate (z-axis, 90) * Rotate (z-axis, 45) = Rotate (z-axis, 45) * Rotate (z-axis, x1), x1=
12. Convert the following Target Camera to Free Camera.....

(درجات الامتحان: الدرجة الكلية 50 درجة موزعة على خمسة أسئلة بواقع 10 درجات عن كل سؤال - 5 درجات عن كل فقرة)
أجب عما يأتي:-

1- أ) أثبت أن $u(x, t) = f(2x + 5t) + g(2x - 5t)$ حلاً للمعادلة التفاضلية $4u_{tt} = 25u_{xx}$ ثم أوجد الحل الذي يحقق الشروط $u(x, 0) = \sin 2x$, $u_t(x, 0) = 0$, $u(0, t) = u(\pi, t) = 0$.

ب) أوجد الحل العام للمعادلة التفاضلية $z_{xx} - 2z_{xy} + z_{yy} = (x + y) + e^{x+y} + \tan(x + y)$.

2- أ) باستخدام تحويلات لابلاس - حل المعادلة التفاضلية $u_t = u_{xx}$ إذا كانت

$$u(x, 0) = 3 \sin 2\pi x, u(0, t) = u(1, t) = 0, 0 < x < 1, t > 0.$$

ب) أثبت أن الحل الكامل للمعادلة التفاضلية $z = xz_x + yz_y + \sqrt{(z_x)^2 + (z_y)^2 + 1}$ يمثل مجموعة مستويات غلافها كرة مركزها نقطة الأصل ونصف قطرها الوحدة.

3- أ) استخدم طريقة التكامل في إيجاد الحل العام للمعادلة التفاضلية $z_{xx} + z_{xy} - 2z_{yy} = (y + 3)e^x$.

ب) أوجد الحل العام للمعادلة التفاضلية $z_{xy} = xy^2$ ثم أوجد الحل الذي يحقق الشروط:

$$z(x, 1) = \cos x, \quad z(0, y) = y^2.$$

4- أ) أوجد الحل الكامل والحل المفرد - إن وجد - للمعادلة التفاضلية $z^2 \left[(z_x)^2 + (z_y)^2 + 1 \right] = 1$.

ب) بطريقة فصل المتغيرات - حل المعادلة التفاضلية $z_{xx} - 4z_{yy} = 0$ والتي تحقق الشروط:

$$z = z_y = \sin x, \quad y = 0.$$

5- أوجد الحل العام لكل من المعادلتين التفاضليتين :

$$i) z_{xx} + 2z_{xy} + z_{yy} - 4z_x - 4z_y + 3z = e^{x+y} \cos(2x - y),$$

$$ii) x^2 z_{xx} - 2xyz_{xy} + y^2 z_{yy} - xz_x + 3yz_y = \frac{8y}{x}.$$

انتهت الأسئلة ...

د. محمد عبدالله عبدالرازق

 قسم الرياضيات كلية العلوم	المقرر : بحوث عمليات (2) 426 الفرقة : المستوى الرابع علوم الزمن : 3 ساعات التاريخ : السبت 2024/1/4 الدرجة : 50 درجة	جامعة اسيوط كلية العلوم قسم الرياضيات امتحان الفصل الاول للعام الجامعي 2024-2025
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أجب عن الأسئلة الآتية: كل سؤال (10 درجات)

السؤال الأول: (أ) برهن أن الشرط الضروري للدالة $f(x)$ المرتبطة بالقيود $c_i(x) = 0$ لكي تكون لها نقطة نهاية صفري نسبية عند x^* هو ان المشتقات الجزئية لدالة لاجرانج بالنسبة الي كل عنصر من عناصرها لابد أن يساوب الصفر.

(ب) حدد القيم القصوى للدالة $f(x) = 3x^4 - 20x^3 + 36x^2 + 16$.

السؤال الثاني: (أ) أوجد مفكوك تيلور حتي الدرجة الثانية للدالة $f(x) = x_2^2 x_3 + x_1 e^{x_3}$ حول النقطة

$$\underline{x}^* = (1, 0, -2)$$

(ب) أوجد مصفوفة الهسين للدالة $f(x) = x_2^2 x_3 + x_1 e^{x_3}$ عند النقطة $\underline{x}^* = (2, -1, 3)$.

السؤال الثالث: أستخدم طريقة مضروبوات لاجرانج في حل المشكلة التالية

$$Max \ f(x_1, x_2) = x_1^2 x_2 \quad s.t \quad g(x_1, x_2) = 2x_1^2 + 2x_1 x_2 - 12 = 0$$

ثم طبق الشرط الكافي لمعرفة ان النقطة نهاية عظمى .

السؤال الرابع: بأستخدام طريقة خطوة الانحدار الشديد أوجد طول الخطوة α للدالة

$$f(x) = 3x_1^2 + 2x_2^2 + 2x_1 x_2 + 7 \quad \text{ثم اوجد الحل عند } (x_1^0, x_2^0) = (1, 2)$$

السؤال الخامس: (أ) بأستخدام طريقة نيوتن اوجد القيمة الصغرى للدالة $f(x) = 2x_1^2 + x_2^2 - 2x_1 x_2$

$$\text{عندما } (x_1^0, x_2^0) = (5, 5)$$

(ب) استخدم دالة الجزاء (penalty) اوجد حل المسألة التالية

$$Min \ f(x) = (x_1 - 1)^2 + (x_2 - 2)^2$$

$$s.t \quad g(x) = x_1 + x_2 - 4 = 0$$

تمنياتي بالنجاح والتوفيق

د/ مصطفى علي الخطيب

Notes:

- Cheating or Trying to Cheat may disqualify you from the course.
- ChatGPT or any AI tool is not allowed in this exam. Use only HI (Human Intelligence)!

Question 1) (10 Points) MCQ Questions, Please Select the Correct Answer

Q1) One of the differences between CV and Resume is

- | | |
|--|---|
| a. CV is limited in pages | b. Resume more suitable for research position |
| c. CV is arranged in reverse chronologically | d. Resume is a summary |

Q2) The CV Header should include

- | | |
|---------------------|--------------|
| a. Education | b. Summary |
| c. Technical Skills | d. Your Name |

Q3) You live in Assiut, you are looking for a position in Cairo and you do not have a place to stay there

- | | |
|--|--|
| a. Write Cairo as your city in the CV | b. Do not mention the city at all in your CV |
| c. Write Assiut with Ready to Relocate statement | d. Write both cities in your CV |

Q4) One of the GitHub Best Practices is

- | | |
|----------------------------|---------------------------------------|
| a. Choose a good username | b. Upload projects as an archive file |
| c. Copy projects as a fork | d. Have a readme file |

Q5) The common standard of probation period in most of the employment contracts are

- | | |
|-------------|-------------|
| a. 12 month | b. 3 months |
| c. 7 months | d. 6 months |

Question 2) (20 Points) Answer the following questions.

-) (3 Points) Write three job titles/roles related in Software Industry
-) (4 Points) What are the types of companies in the classification by product?
- (3 Points) Mention three work ethics that have been studied.
- (4 Points) Mention the 4 values of Agile Development.
- (6 Points) Mention the 5 events of Scrum Framework.

Question 3) (20 Points)

- a) (10 points) Given the following project directory status for develop branch which is currently the active branch, answer the following questions

Files	Git Status
hello.cpp, main.cpp	untracked
stdio.h, stdlib.h	staged
user.cpp	modified

1. Write Git commands that commits staged files in a new branch "feature-exam"
 2. Given that active branch is now "feature-exam", write Git commands that merges the "feature-exam" into development branch.
 3. Write Git commands that pull the latest changes from remote development branch.
 4. Write Git commands that commits **only** the untracked files in a **single commit**.
 5. Write Git commands that pushes the updates to GitHub
- b) (4 Points) Break down the following feature that has been requested into tasks:
"As a user in an e-commerce system, you must be able to reset your password in case you forgot it"
- c) (2 Points) Given the following naming in a codebase, write another version that achieve naming consistency

```
Order.New();  
Shipment.MakeFromFile();  
Item.CreateFromList();
```

- d) (2 Points) Architecture styles can be classified into two main types. What are they?
- e) (2 Points) SOLID are set of principles to make the code more adaptive to change.
What SOLID stands for?

Dr. Ahmed Hosny - 2024

Q2) Give a counter example to each of the following false statements (12 pts total; 3 pts each):

- 1) Convergence in a metric space depends only on the underlying set X , and not on the choice of the metric.
- 2) The continuous image of a Cauchy sequence is also Cauchy.
- 3) The parallelogram identity holds for an arbitrary norm on a linear space.
- 4) The space l_p , where $p \neq 2$, is a Hilbert space.

Q3) Prove or disprove the following statements (14 Pts total; 3.5 pts each) :

- 1) If (X, d_1) is a discrete metric space and (Y, d_2) is any metric space, then any map $T: X \rightarrow Y$ is continuous.
- 2) If $(\mathbb{R}^2, d)$ is the Euclidean metric space, and if $(x_n) \subset \mathbb{R}$ is Cauchy sequence in $\mathbb{R}$, then $(x_n, \sin x_n)$ is a Cauchy sequence in $\mathbb{R}^2$.
- 3) The set of all real-valued continuous functions on $[0, 1]$, equipped with the metric $d(x, y) = \int_0^1 |x(t) - y(t)| dt$, forms a complete metric space.
- 4) Every metric space is a normed space.

Q4) (12 Pts total; 4 pts each) :

4- a) Let $X = \{x \in \mathbb{R}; x \geq 1\} \subset \mathbb{R}$, equipped with the usual metric. If $T: X \rightarrow X$ is the map defined by $Tx = \frac{x}{2} + \frac{1}{x}$, apply the Banach fixed point theorem to determine whether T has a unique fixed point.

b) Let X be the space of differentiable functions on $[0, 1]$, and let $Y = C[0, 1]$, both equipped with the supremum norm. Define $T: X \rightarrow Y$ as the linear operator $Tf(x) = \frac{df(x)}{dx}$.

Discuss the continuity of T .

c) Let $T: \mathbb{R}^n \rightarrow \mathbb{R}^m$ be the transformation defined by $TX = AX$, where $A = [a_{ij}]$ is a nonzero $m \times n$ matrix. Justify that T possesses the properties of linearity and continuity.

Prof. Dr. A.M. Gaddaek ... With best wishes ... Signature : Gaddaek



Faculty of science

Department of Mathematics

Final Term Exam (1st Term)

Fourth year student (Math)

Course: Functional Analysis

Code: 411 M

Time : 2 Hours

Points : 50 Points

Date: Saturday, 4 Jan 2025



Assiut University

الإمتحان مُكون من أربعة أسئلة - تقع الأسئلة في صفتين- مطلوب الإجابة عنها جميعاً

Q1) True/False Questions: Classify the following statements as true or false (12 pts total : 1.5 pts each):

- 1) The closure of a set A in a metric space (X, d) is the set of all limit points of A . (True-False)
- 2) The set $\mathbb{Q}$ is an example of a dense set in the usual metric space $(\mathbb{R}, d)$. (True-False)
- 3) A map $f: X \rightarrow Y$ between metric spaces (X, d_1) and (Y, d_2) is continuous at $x = c \in X$ if there exists a sequence $(x_n) \subset X$ such that $x_n \rightarrow c$ implies $f(x_n) \rightarrow f(c) \in Y$. (True-False)
- 4) The map $Tx = x^2$ is a contraction on $[0, 1]$. (True-False)
- 5) A set A in a metric space is closed if and only if every convergent sequence in A has its limit point in A . (True-False)
- 6) The sequence $(x_n) = (n)$ in the metric space $(\mathbb{N}, d(m, n) = \left| \frac{1}{m} - \frac{1}{n} \right|)$, for all $m, n \in \mathbb{N}$, is a Cauchy sequence. (True-False)
- 7) The pair $(C[-1, 1], \|f\| = \left(\int_{-1}^1 |f(t)|^2 dt \right)^{\frac{1}{2}})$ is a Banach space. (True-False)
- 8) Every inner product space is a normed space equipped with a norm induced by the inner product. (True-False)

Please turn the page

1/3

31. What kind of data structure better than Access Matrix
- a A linked list
 - b A queue
 - c A and B
 - d Neither A nor B
32. Malware is designed to replicate itself independently without user interaction
- a Trojan
 - b Virus
 - c Worm
 - d All of the above
33. A malware can hide its presence to avoid detection
- a Rootkit
 - b Spyware
 - c Adware
 - d Ransomware
34. Logic Bomb malware is
- a Spread automatically over a network
 - b Triggered by a specific event
 - c Display pop-up ads on a user's system
 - d Record keystrokes on a system
35. A malware requires a host program to spread
- a Virus
 - b Worm
 - c Trojan
 - d A and B
36. Virus specific to operating system except
- a Encrypted virus
 - b Stealth virus
 - c Polymorphic virus
 - d Macro virus
37. Part A in the virus code illustrates
- ```

Program V :=
{goto main;
 4567898765;
 {loop:
 file := get-random-executable-file;
 if (first-line-of-file = 4567898765)
 then goto loop
 else prepend V to file;}}

```
- Part A {
- a Propagation phase
  - b Triggering phase
  - c Dormant phase
  - d Execution phase
38. A compression virus is
- a Disguised as system updates
  - b Virus compresses infected file to be shorter than the original file by the size of the virus.
  - c Spread through physical devices only
  - d Infect compressed files only
39. In crypt3, how is the password typically stored
- a As an encrypted string
  - b As a clear text string
  - c As a hashed string with a salt
  - d As an encrypted file
40. Steganography is hiding
- a Secret information
  - b Secret communications
  - c Secret data
  - d A and B

Yara Raslan  
Computer Science Department  
Faculty of Computers and Information



20. DAC system, who has the authority to change access permissions of resources
- a The system administrator
  - b The resource owner
  - c Only root users
  - d Security officers
21. Which of the following is true about the MAC system
- a "No Read Up, No Write Down" policy
  - b Owner defines the access permissions
  - c Users define their access permissions
  - d No correct choice
22. Which of the following is TRUE about the assignment of permissions in RBAC
- a Permissions are not part of RBAC
  - b Owner manages permissions
  - c Permissions are assigned to users directly
  - d Users are assigned to roles, then permissions are assigned to roles
23. Which is a corrective countermeasure that helps after an attack detected
- a Disabling the affected user accounts
  - b Encrypting sensitive data
  - c Installing a firewall
  - d All of the above
24. Which of the following would be considered a passive attack
- a Password cracking
  - b Monitoring network traffic for analysis
  - c Web spoofing
  - d A and C
25. A denial-of-service (DoS) attack is an example of which type of attack
- a Passive attack
  - b Hybrid attack
  - c Active attack
  - d Social engineering attack
26. Which of the following scenarios best describes a Chosen Plaintext Attack (CPA)
- a An attacker chooses both the plaintext and the corresponding ciphertext
  - b An attacker attempts to brute-force the encryption key
  - c An attacker has access to ciphertexts and tries to retrieve the plaintext
  - d An attacker selects a plaintext and obtains the corresponding ciphertext.
27. What does the concept of "least privilege" mean in the context of RBAC
- a All users should be given the highest level of access
  - b Permissions should be based on the administrator preference
  - c Users should only be assigned permissions necessary for their role
  - d Permissions should be based on the user's preference
28. The Access Matrix model
- a Easy to implement in large systems.
  - b Lead to a large and sparse matrix, making it inefficient
  - c A and B
  - d Neither A nor B
29. In Access Matrix, the user has a "read" permission for a resource, that's means
- a User cannot access the resource at all
  - b User reads the resource and gives the permission to another user
  - c User can only access the resource but not modify it
  - d The user can modify and delete the resource
30. In an Access Matrix, what does each row represent
- a A resource
  - b A specific permission
  - c A user
  - d A combination of user and resource

**9. Which of the following is a typical defense against active attacks**

- a Use of encryption to protect data in transit
- b Network monitoring tools to detect unusual traffic patterns
- c Regular updates and patching to fix vulnerabilities
- d All of the above

**10. In a stream cipher, the encryption process typically involves:**

- a Encrypting plaintext blocks with a key
- b Applying a hash function to the plaintext
- c Encrypting the plaintext using the same key multiple times
- d Generating a pseudorandom keystream, XORing it with the plaintext

**11. Which of the following is an example of stream cipher**

- a RC4
- b RSA
- c AES
- d DES

**12. What is the best defense against both Dictionary Attacks and Rainbow Table Attacks**

- a Store passwords in plain text
- b Use long, complex passwords and a unique salt for each password
- c Use weak cryptographic algorithms
- d Use short passwords

**13. How does salting affect the time required for cracking a password**

- a Speeds up the cracking process
- b No effect on the time for cracking
- c Increase the time for cracking
- d The password impossible to crack

**14. Which authentication method uses a combination of something the user knows, something the user has, and something the user is**

- a Single-factor authentication
- b Password-based authentication
- c Two-factor authentication
- d Multi-factor authentication

**15. Which of the following is the primary advantage of using digital envelopes in cryptography**

- a Combining the speed of symmetric with the security of asymmetric
- b Ensure that both encryption and decryption are done using asymmetric
- c Using of public key cryptography for both encryption and decryption
- d Eliminate the need for public key

**16. Digital envelope is a weak technology in terms of**

- a Authorization
- b Authentication
- c Integrity
- d All of the above

**17. What is the role of the recipient's private key in a digital envelope system**

- a Encrypt the message
- b Generate symmetric encryption key
- c Decrypt symmetric key sent by sender
- d Sign the encrypted message

**18. False nonmatch rate in high-security application must be**

- a High rate
- b Low rate
- c Reasonable rate
- d According of problem

**19. The biometric systems using in**

- a Verification process
- b Identification process
- c Neither A nor B
- d A and B





Computer Security  
Code: 453  
50 Marks

date: 3/1 /2025  
Time: 2 Hour



Choose the right answer:

50 Marks

1. What is the main purpose of a firewall in a computer network

- a To prevent unauthorized access to or from a private network.
- b To back up data
- c To encrypt sensitive information
- d To clean malware from the system

2. What is "ransomware"

- a A tool for improving network security
- b A software used to protect backups
- c A malware that encrypts files and demands payment to decrypt
- d A method of securely sharing passwords

3. What is a "Trojan Horse" in computer security

- a A security measure that restricts access to a network
- b A method for securing passwords through complex encryption
- c A method for securing passwords through complex encryption
- d A program disguised as legitimate software but performs harmful actions

4. Which of the following is a core benefit of implementing a "Security in Depth" strategy

- a Increases the cost of security without providing significant protection
- b Limits the effectiveness of attacks by requiring an attacker to breach multiple layers
- c Reduces the number of firewalls required
- d Ensures that a single layer of security is sufficient to protect the system

5. A company uses an automated tool that scans incoming emails for malicious attachments or links. This is an example of a:

- a Preventive countermeasure
- b Detective countermeasure
- c Corrective countermeasure
- d Recovery countermeasure

6. What is the main purpose of confusion in a cryptographic system

- a To ensure the ciphertext looks like random data
- b To ensure the encryption process is simple and straightforward.
- c To increase the speed of encryption
- d To make it difficult to reverse the encryption without the key

7. How many different S-Boxes are used in the DES algorithm

- a 16
- b 1
- c 8
- d 4

8. What is the primary role of a Substitution Box (S-Box) in cryptography

- a To encrypt data in a non-linear manner
- b To swap the positions of data blocks
- c To transform input data into output data by using a predefined table
- d To permute the bits of input data

ب) الكود المجاور يستخدم لرسم دالة التوزيع للتوزيع الطبيعي لقيم  $x = 0:0.01:40$  في ضوء ذلك أكمل الثلاثة فقرات الآتية  
 $\text{mean } \mu=20$  , standard deviation  $\sigma=4$

```
x = 0:0.01:40;
pd=①.....('Normal','mu',20,'sigma',4)
y = ②.....(pd,x)
③.....(x,y,'r*')
xlabel('x','fontsize',14);
ylabel('Normal Distribution pdf','fontsize',14);
```

ج) أكمل مكان النقاط في الكود التالي لاستخدم طريقة ملن لحل المعادلة التفاضلية  $y'(x) = 2x + y$ ,  $y(1) = 3$ ,  $n = 4$

```
function y=MyMilen(x0,y0,xn,n)
f=①.....;
②.....
y(1)=y0;
③.....
for i=1:n-1
x(i+1)=x(i)+h;
y(i+1)=④.....
end
for i = n
x(i+1)=⑤.....;
ynew=y(i-3)+(4*h/3)*(2*f(x(i),y(i))-3*f(x(i-1),y(i-1))+2*f(x(i-2),y(i-2)));
y(i+1)=y(i-1)+(h/3)*(4*f(x(i),y(i))+f(x(i-1),y(i-1))+f(x(i+1),ynew));
End
y=MyMilen(.....⑥.....)
```

انتهت الأسئلة

مع أجمل أمنياتنا بالتوفيق والنجاح للجميع د. / معتز الخطيب - د. / إسراء جمال

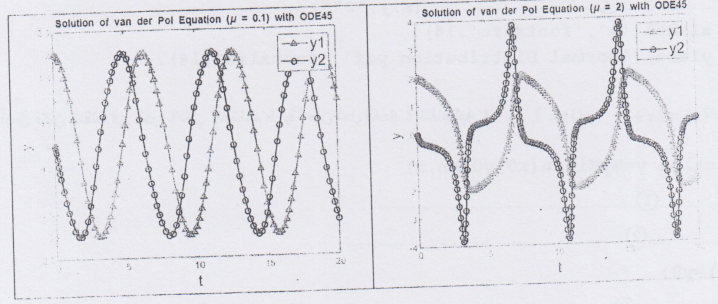


**السؤال الرابع :- (15 درجة)**

أ) معادلات فان دير بول تستخدم لوصف الظواهر التذبذبية في العديد من النظم الفيزيائية

$$\frac{dy_1}{dt} = y_2, \quad \frac{dy_2}{dt} = \mu(1 - y_1^2)y_2 - y_1.$$

أكمل مكان النقاط في الكود التالي لاستخدام الماتلاب في حل هذه المعادلات في الفترة  $[0, 20]$  والشروط الابتدائية  $[y_1(0)=2, y_2(0)=1]$  لقيم مختلفة من معامل التخميد  $\mu$ ، لاحظ أن قيم  $\mu$  الصغيرة تؤدي إلى تذبذبات بسيطة ومتناغمة، قيم  $\mu$  الكبيرة تؤدي إلى تذبذبات غير متناغمة وحادة كما بالشكل:



```
function dydt = vdp1(t,y,mu)
dydt = [.....①.....; mu*(1-y(1)^2)*y(2)-y(1)];
[t,y] =②.....(@ (t,y)vdp1(t,y,1), [0 20], [2; 0]);
.....③.....(t,y(:,1), '-o', t,y(:,2), '-o')
.....④.....('Solution of van der Pol Equation');
xlabel('Time t');
ylabel('Solution y');
.....⑤.....('y_1', 'y_2')
```

⑥ اكتب السطر اللازم تغييره في الكود لإيجاد الحل عند  $\mu = 0.1$  و  $\mu = 2$

.....

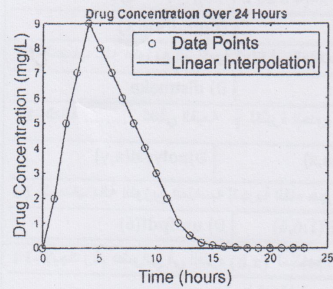
.....

.....

.....

.....

(6 درجات)



ب) إذا كنت تعمل مهندساً في شركة تصنيع الأدوية، ولديك بيانات عن تركيز مادة دوائية في الدم على مدار 24 ساعة، الكود التالي يستخدم برنامج الـ MATLAB لرسم هذه البيانات. أكمل مكان النقاط من 1: 5 لعمل استيفاء خطي للبيانات لإيجاد تركيز الدواء في أي وقت خلال الـ 24 ساعة كما في الشكل

% Linear interpolation

% بيانات تركيز الدواء

time = 0:1:23;

concentration = [0, 2, 5, 7, 9, 8, 7, 6, 5, 4, 3, 2, 1, 0.5, 0.2, 0.1, 0.05, 0.02, 0.01, 0, 0, 0, 0];

x\_new = 0:2:23;

y\_new = ..... ① ..... (time, concentration, x\_new, '② .....');

plot(time, concentration, 'k0'); hold;

..... ③ ..... (x\_new, y\_new, 'k', 'linewidth', 1);

hold; grid;

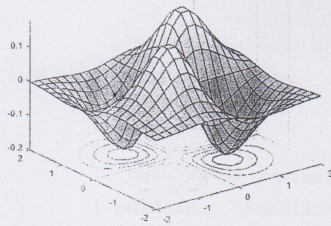
xlabel('Time (hours)', 'fontsize', 15);

ylabel('Drug Concentration (mg/L)', 'fontsize', 15);

..... ④ ..... ('Drug Concentration Over 24 Hours');

..... ⑤ ..... ('Data Points', 'Linear Interpolation', 'fontsize', 15)

(5 درجات)



ج) أكمل الفراغات في الكود التالي لرسم السطح الموضح في الشكل المجاور

[x,y] = ① ..... (-2:0.2:2, -2:0.2:2);

z=x.\*y.\*exp(-x.^2-y.^2);

figure

② ..... (x,y,z)

.... ③ ..... autumn

(3 درجات)



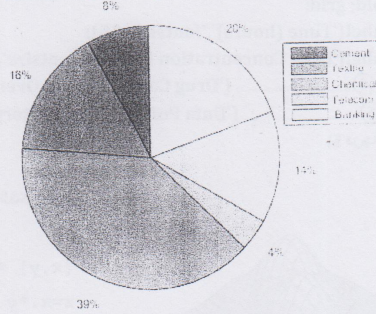
|                                                                                                               |                    |                         |                        |
|---------------------------------------------------------------------------------------------------------------|--------------------|-------------------------|------------------------|
| 10- لحساب التباين للمتجه $x=[4\ 8\ 20\ 2\ 7\ 10]$ نستخدم الأمر                                                |                    |                         |                        |
| A) var(x)                                                                                                     | B) std(x)          | C) mean(x)              | D) median(x)           |
| 11- لحساب دالة التوزيع التراكمي $F(x)$ في الماتلاب نستخدم                                                     |                    |                         |                        |
| A) pdf                                                                                                        | B) cdf             | C) makedist             | D) distmake            |
| 12- الدالة ..... تعطي القيمة $y$ لكثيرة الحدود التي معاملاتها $a$ عند الاحداثي $x$                            |                    |                         |                        |
| A) random(a,x)                                                                                                | B) polyfit(a,x)    | C) polyval(a,x)         | D) polyval(a,y)        |
| 13- لحساب دالة التوزيع المناسبة لتجربة القاء حجر نرد نستخدم الأمر                                             |                    |                         |                        |
| A) Poisson(6)                                                                                                 | B) unidpdf(1:6,6)  | C) normpdf(1:6,6)       | D) unifpdf(6)          |
| 14- لإيجاد رقم عشوائي في الفترة $(a,b)$ نستخدم الأمر.....                                                     |                    |                         |                        |
| A) $a+(b-a)*rand(1,1)$                                                                                        |                    | B) $(b-a)*rand(1,1)$    |                        |
| C) $a+(b-a)*rand(a,b)$                                                                                        |                    | D) $a+b*rand(1,1)$      |                        |
| 15- يتلقى قسم شرطة في المتوسط 5 مكالمات في الساعة فيكون احتمال تلقي مكالمتين في ساعة مختارة عشوائياً هو ..... |                    |                         |                        |
| A) $y1 = pdf('poiss',2,5)$                                                                                    | B) $y1 = pdf(2,5)$ | C) $y1 = ('poiss',2,5)$ | D) لا توجد اجابه صحيحة |

### السؤال الثالث: - (10 درجات)

(أ) الكود الموضح يستخدم لتمثيل البيانات الموضحة في الجدول لتركيز الصناعات المختلفة في دولة ما كما بالشكل في ضوء ذلك أكمل مكان النقاط في الفقرتين الآتيتين:

| industry | Units |
|----------|-------|
| Cement   | 4     |
| Textile  | 8     |
| Software | 20    |
| Chemical | 2     |
| Telecom  | 7     |
| Banking  | 10    |

Pie char showing percentage of different industries



```
industry=[4 8 20 2 7 10];
.....①.....(industry);
title('Pie char showing percentage of different industries');
labels = {'Cement','Textile','Chemical','Telecom',' Banking'};
.....②.....(labels)
(درجتين)
```

السؤال الثاني: - اختر الإجابة الصحيحة في العبارات التالية: (15 درجة لكل فقرة درجة)

|                                                                                                                                                                                                                        |  |                                                                      |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------------------------------------------------------|--|
| 1- لحل معادلة ببسمل التفاضليه $t^2 \frac{d^2x}{dt^2} + t \frac{dx}{dt} + (t^2 - n^2)x = 0$ بلغة الماتلاب نستخدم الكود                                                                                                  |  |                                                                      |  |
| A) syms t n;<br>x1=dsolve('t^2*D2x+t*Dx+(t^2-n^2)*x=0',t)                                                                                                                                                              |  | B) syms t n;<br>x1=dsolve('t^2D2x+tDx+(t^2-n^2)x=0',t)               |  |
| C) x1=dsolve('t^2*D2x+t*Dx+(t^2-n^2)*x=0',t)                                                                                                                                                                           |  | D) syms t n;<br>x1=dsolve('t^2*x'+tx'+(t^2-n^2)*x=0',t)              |  |
| 2- لحساب التكامل $\int_0^{\infty} \frac{\cos x}{\sqrt{x}} dx$ بلغة الماتلاب نستخدم الكود                                                                                                                               |  |                                                                      |  |
| A) I1=int(cos(x)/sqrt(x),x,0,inf)                                                                                                                                                                                      |  | B) syms x;<br>I1=integrate(cos(x)/sqrt(x),x,0,inf)                   |  |
| C) syms x;<br>I1=int(cos(x)/sqrt(x),x,0,inf)                                                                                                                                                                           |  | D) syms x;<br>I1=int(cos(x)/sqrt(x),x,0,inf)                         |  |
| 3- لحساب التفاضل الرابع للدالة $(\sin x)^{10}$ بلغة الماتلاب نستخدم الكود                                                                                                                                              |  |                                                                      |  |
| A) D[Sin(x)^10,{x,4}]                                                                                                                                                                                                  |  | B) D[Sin(x)^10,{x,4}]                                                |  |
| C) Diff[Sin(x)^10,{x,4}]                                                                                                                                                                                               |  | D) syms x; D[Sin(x)^10,x,4]                                          |  |
| 4- لحساب تفاضل الدالة $f(x) = x^n$ بلغة الماتلاب نستخدم الكود                                                                                                                                                          |  |                                                                      |  |
| A) Diff[x^n,x]                                                                                                                                                                                                         |  | B) D[x^n,x]    C) syms x; D[x^n,x]    D) syms x n; D[x^n,x]          |  |
| 5- لايجاد حل المعادلة الآتية $e^{-2x}-1=0$ نستخدم الأمر                                                                                                                                                                |  |                                                                      |  |
| A) solve                                                                                                                                                                                                               |  | B) sol    C) roots    D) polyval                                     |  |
| 6- لحساب التكامل $\int \frac{1}{x^3+1} dx$ بلغة الماتلاب نستخدم الكود                                                                                                                                                  |  |                                                                      |  |
| A) Integrate[1/(x^3+1),x]                                                                                                                                                                                              |  | B) Int[1/(x^3+1),x]                                                  |  |
| C) integrate(1/(x^3+1),x)                                                                                                                                                                                              |  | D) syms x; Int[1/(x^3+1),x]                                          |  |
| 7- لحساب تفاضل الدالة $y(x) = \sqrt{x \sin x \sqrt{1-e^x}}$ بلغة الماتلاب نستخدم الكود                                                                                                                                 |  |                                                                      |  |
| A) syms x; D1=simple(diff f):<br>f=sqrt(x*sin(x)*sqrt(1-exp(x)));                                                                                                                                                      |  | B) f=sqrt(xsin(x)*sqrt(1-exp(x)));<br>D1=simple(diff(f))             |  |
| C) syms x;<br>f=sqrt(x sin(x) sqrt(1-exp(x)));<br>D1=simple(diff(f))                                                                                                                                                   |  | D) syms x;<br>f=sqrt(x*sin(x)*sqrt(1-exp(x)));<br>D1=simple(diff(f)) |  |
| 8- لتحليل كثيرة الحدود $x^2 - 2x + 3$ في برنامج الماتلاب نستخدم الأمر                                                                                                                                                  |  |                                                                      |  |
| A)Expand                                                                                                                                                                                                               |  | B)Factor    C)Apart    D)Simplify                                    |  |
| 9- إذا كان من المعلوم أن عدد الوحدات التي تستهلكها الأسرة من سلعة معينة خلال الشهر تتبع توزيع بواسون بمتوسط 3 وحدات شهرياً، لحساب الوسيط الحسابي، والانحراف المعياري لعدد الوحدات المستهلكة بلغة الماتلاب نستخدم الكود |  |                                                                      |  |
| A) pd = makedist('Poisson','lambda',3)<br>m=mean(pd) s=std(pd)                                                                                                                                                         |  | B) pd = distmake('Poisson','lambda',3)<br>m=mean(pd) s=std(pd)       |  |
| C) pd = makedist('Poisson','lambda',3)<br>m=median(pd) s=var(pd)                                                                                                                                                       |  | D) pd = dist('Poisson','lambda',3)<br>m(pd) std(pd)                  |  |



|                                                    |                                                                                   |                         |
|----------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------|
| Department of Mathematics                          |  | قسم الرياضيات           |
| Faculty of science                                 |                                                                                   | كلية العلوم             |
| الاختبار النهائي لقرور تطبيقات الحاسب في الرياضيات |                                                                                   |                         |
| المستوى : الرابع                                   | الفصل الدراسي الأول                                                               | زمن الاختبار : ساعتان   |
| الكود : 469 رك                                     | م 2025/2024                                                                       | الدرجة الكلية : 50 درجة |

السؤال الأول: - (10 درجات درجة لكل فقرة)

ضع علامة (✓) امام الاجابة الصحيحة وعلامة (x) امام الاجابة الخاطئة:

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ( ) | 1- إذا كانت البيانات المأخوذة من تجربة ضخ الماء تعبر عن النموذج غير الخطي التالي للإجهاد ثنائي الأبعاد<br>$\sigma = \alpha e^{\beta x} \cos(\phi y) \cdot \sin(\theta x)$ <p>لرسم هذا التوزيع في برنامج الماتلاب نستخدم الامر <code>pie</code></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| ( ) | 2- لرسم دالة التوزيع لتوزيع بواسون لقيم $\lambda = 4$ , $x = 0:15$ نستخدم الكود<br>$x = 0:15;$<br>$y = \text{poisspdf}(x,4);$<br>$\text{bar}(x,y)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| ( ) | 3- يستخدم الامر <code>cdf</code> للحصول على قيمة دالة الكثافة الاحتمالية لتوزيع معين عند قيمة معينة او مجموعة قيم من المتغير العشوائي $x$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| ( ) | الكود التالي يستخدم طريقة Adams لحل المعادلة التفاضلية<br>$y' = x + y, y(0) = 1, \text{ at } x = 0.6,$<br>$\text{with } n = 3$<br>في ضوء ذلك أجب عن الخمس فقرات المجاورة<br><code>function y=MyAdams(x0,y0,xn,n)</code><br><code>f=.....(1).....;</code><br><code>x(1)=x0;</code><br><code>y(1)=y0;</code><br><code>.....(2).....;</code><br><code>for i=1:n-1</code><br><code>x(i+1)=x(i)+h;</code><br><code>y(i+1)=.....(3).....;</code><br><code>end</code><br><code>for i = n</code><br><code>x(i+1)=.....(4).....;</code><br><code>y(i+1)=y(i)+(h/12)*(23*f(x(i),y(i))-16*f(x(i-1),y(i-1))</code><br><code>+5*f(x(i-2),y(i-2)));</code><br><code>end</code><br><code>&gt;&gt; y=MyAdams(.....(5).....)</code> |
| ( ) | 4- الطريقة المناسبة لكتابة الدالة في المكان (1) هي<br><code>@(x,y)x+y</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| ( ) | 5- الامر المناسب للسطر (2) هو<br><code>h=(xn-x0)/n</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| ( ) | 6- الكود المستخدم لتعريف $y(i+1)$ عند الموضع (3) هو<br><code>y(i+1)=fxy(x(i),y(i));</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| ( ) | 7- الكود المستخدم لتعريف $x(i+1)$ عند الموضع (4) هو<br><code>x(i+1)=x(i)+h;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| ( ) | 8- الطريقة الصحيحة لاستدعاء الدالة عند الموضع (5) هي<br><code>y=MyAdams(1,0,3,0.6)</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| ( ) | 9- لحساب تفاضل الدالة $y(x) = \sqrt{x \sin x \sqrt{1 - e^x}}$ بلغة الماتلاب نستخدم الكود<br><code>syms x;</code><br><code>f=sqrt(xsin(x)*sqrt(1-exp(x)));</code><br><code>D1=diff(f)</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| ( ) | 10- لحل معادلة لاغندر التفاضلية $(1 - t^2) \frac{d^2x}{dt^2} - 2t \frac{dx}{dt} + n(n+1)x = 0$ بلغة الماتلاب نستخدم الكود<br><code>syms t n; x1=solve('(1-t^2)*D2x-2*t*Dx+n*(n+1)*x=0','t')</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

|                              |                                        |                             |
|------------------------------|----------------------------------------|-----------------------------|
| المادة: نمذجة رياضية (٤٣٤ ر) | امتحان نهاية الفصل الأول ٢٠٢٥ / ٢٠٢٤ م | قسم الرياضيات - كلية العلوم |
| الزمن: ٣ ساعات               | للفرقة الرابعة علوم شعبة الرياضيات     |                             |
| التاريخ: ١٨ / ١ / ٢٠٢٥ م     |                                        |                             |

أجب عن خمسة فقط مما يلي: (العظمي ٥٠ درجة (كل سؤال ١٠ درجات)

#### السؤال الأول:

أ- ما الغرض من دراسة موضوع النمذجة الرياضية (أذكر أربع نقاط)

ب- عرف أو بين المقصود بالنمذجة الرياضية وأذكر فقط مراحلها الخمس الأساسية

#### السؤال الثاني:

استخدم فن النمذجة في استنتاج المعادلة الرياضية للتوتر السطحي من خلال غشاء سطحي متوتر وكذلك في إيجاد معادلة تصف الانتشار الحراري في وسط موضحا بعض الشروط الابتدائية إذا كان الفيض الحراري معلوم

#### السؤال الثالث:

استخدم طريقة المربعات الصغرى لإيجاد أحسن خط مستقيم يمر بالنقاط الآتية وذلك بطريقتين:

|    |     |     |     |     |     |
|----|-----|-----|-----|-----|-----|
| X= | 2   | 3   | 4   | 5   | 6   |
| Y= | 1.1 | 1.9 | 2.6 | 3.4 | 4.3 |

#### السؤال الرابع:

ناقش الحل التقريبي لنظام فيزيائي متذبذب إذا كان تردده الطبيعي دالة في الزمن

#### السؤال الخامس:

ناقش مسألة رايلي -تيلور للاستقرار واستنتج معادلة التشتت

#### السؤال السادس:

أ- تكلم عن مصادر الخطأ في الطرق العددية وبين كيف يمكن تجنبها بقدر الامكان

ب- أذكر ما تعرفه عن ظاهرة الرنين في الأنظمة الكهربية أو الأنظمة الميكانيكية

WITH MY BEST HOPES

راجعته أ د أحمد ماهر M. H. OBIED ALLAH



- c) To reduce the memory access and cycle time  
d) All of the mentioned
38. The fastest data access is provided using \_\_\_\_\_  
a) Caches  
b) DRAM's  
c) SRAM's  
d) Registers
39. The memory which is used to store the copy of data or instructions stored in larger memories, inside the CPU is called \_\_\_\_\_  
a) Level 1 cache  
b) Level 2 cache  
c) Registers  
d) TLB
40. The method of synchronising the processor with the I/O device in which the device sends a signal when it is ready is?  
a) Exceptions  
b) Signal handling  
c) Interrupts  
d) DMA
41. The method which offers higher speeds of I/O transfers is \_\_\_\_\_  
a) Interrupts  
b) Memory mapping  
c) Program-controlled I/O  
d) DMA
42. The time between the receiver of an interrupt and its service is \_\_\_\_\_  
a) Interrupt delay  
b) Interrupt latency  
c) Cycle time  
d) Switching time
43. The carry generation function:  $c_i + 1 = y_{ci} + x_{ci} + x_{yi}$ , is implemented in \_\_\_\_\_  
a) Half adders  
b) Full adders  
c) Ripple adders  
d) Fast adders
44. In full adders the sum circuit is implemented using \_\_\_\_\_  
a) And & or gates  
b) NAND gate  
c) XOR  
d) XNOR
45. In a normal adder circuit, the delay obtained in a generation of the output is \_\_\_\_\_  
a)  $2n + 2$   
b)  $2n$   
c)  $n + 2$   
d) None of the mentioned
46. The final addition sum of the numbers, 0110 & 0110 is \_\_\_\_\_  
a) 1101  
b) 1111  
c) 1001  
d) 1010
47. The product of 1101 & 1011 is \_\_\_\_\_  
a) 10001111  
b) 10101010  
c) 11110000  
d) 11001100
48. The multiplier is stored in \_\_\_\_\_  
a) PC Register  
b) Shift register  
c) Cache  
d) None of the mentioned
49. The multiplicand and the control signals are passed through to the n-bit adder via \_\_\_\_\_  
a) MUX  
b) DEMUX  
c) Encoder  
d) Decoder
50. The multiplier -6(11010) is recorded as \_\_\_\_\_  
a) 0-1-2  
b) 0-1+1-10  
c) -2-10  
d) None of the mentioned

- b) American National Standard Interface
  - c) American Network Standard Interfacing
  - d) American Network Security Interrupt
27. \_\_\_\_\_ register Connected to the Processor bus is a single-way transfer capable.
- a) PC
  - b) IR
  - c) Temp
  - d) Z
28. In multiple Bus organisation, the registers are collectively placed and referred as \_\_\_\_\_
- a) Set registers
  - b) Register file
  - c) Register Block
  - d) Map registers
29. The main advantage of multiple bus organisation over a single bus is \_\_\_\_\_
- a) Reduction in the number of cycles for execution
  - b) Increase in size of the registers
  - c) Better Connectivity
  - d) None of the mentioned
30. The ISA standard Buses are used to connect \_\_\_\_\_
- a) RAM and processor
  - b) GPU and processor
  - c) Harddisk and Processor
  - d) CD/DVD drives and Processor
31. The duration between the read and the mfc signal is \_\_\_\_\_
- a) Access time
  - b) Latency
  - c) Delay
  - d) Cycle time
32. The minimum time delay between two successive memory read operations is \_\_\_\_\_
- a) Cycle time
  - b) Latency
  - c) Delay
  - d) None of the mentioned
33. \_\_\_\_\_ is the bottleneck, when it comes computer performance.
- a) Memory access time
  - b) Memory cycle time
  - c) Delay
  - d) Latency
34. VLSI stands for \_\_\_\_\_
- a) Very Large Scale Integration
  - b) Very Large Stand-alone Integration
  - c) Volatile Layer System Interface
  - d) None of the mentioned
35. A memory organisation that can hold upto 1024 bits and has a minimum of 10 address lines can be organized into \_\_\_\_\_
- a) 128 X 8
  - b) 256 X 4
  - c) 512 X 2
  - d) 1024 X 1
36. The RAMBUS requires specially designed memory chips similar to \_\_\_\_\_
- a) SRAM
  - b) SDRAM
  - c) DRAM
  - d) DDRAM
37. The reason for the implementation of the cache memory is \_\_\_\_\_
- a) To increase the internal memory of the system
  - b) The difference in speeds of operation of the processor and memory



- 2

2

**FINEL EXAM 4<sup>th</sup> SCIENCE 20025**

- 1



34. The values of  $P(\text{Low}|X)$  and  $P(\text{High}|X)$  respectively are
- a) 12/64 and 12/128
  - b) 3/64 and 0
  - c) 24/64 and 0
  - d) 24/64 and 12/128

35. The unknown  $X$  belongs to the class
- a) Low
  - b) High
  - c) Low and High
  - d) None of them

*End of Exam, with my best wishes:*

**Dr- Abdel-Rahiem Ahmed Hashem Mohammed**

د. عبدالرحيم احمد هاشم محمد

29. For the list  $A = (9 \ 20 \ 2 \ 13 \ 8 \ 12 \ 4)$ , which of the following is correct?  
 a)  $Q2 = IQR$  b)  $Q2 = Q1 + Q3$   
 c)  $Range < IQR$  d) None of the mentioned

30. Celsius temperatures can measure through  
 a) Interval-scale attribute b) Ration-scale attribute  
 c) Ordinal attribute d) Nominal attribute

For the points from (11) to (15), if we have the following data set consists four variables (attributes); the first three are decision variables, **Time**, **Gender** and **Area**, the fourth one is the class label, **Risk**, where:

**Time** is time since obtaining a driver license in years 1-2(little), 2- 7(medium), >7(much)

**Gender** is {male, female}

**Area** is residential area {urban(حضرى), rural(ريفي)}

| Time   | Gender | Area  | Risk (Class label) |
|--------|--------|-------|--------------------|
| little | male   | urban | Low                |
| medium | male   | rural | High               |
| much   | female | rural | Low                |
| little | female | rural | High               |
| much   | male   | rural | High               |
| little | male   | rural | High               |
| medium | female | urban | Low                |
| medium | male   | urban | Low                |

To classify the following example **X** based on this data set, using Bayesian classifier,  $X = (\text{Time} = \text{"much"}, \text{Gender} = \text{"male"}, \text{Area} = \text{"urban"})$

Choose the correct answer:

31. The values of  $P(\text{Low})$  and  $P(\text{High})$  respectively are  
 a)  $4/8$  and  $4/8$  b)  $3/8$  and  $5/8$   
 c)  $0/8$  and  $6/8$  d)  $3/8$  and  $0/8$
32. The values of  $P(X=\text{"much"} | \text{Low})$ ,  $P(X=\text{"male"} | \text{Low})$  and  $P(X=\text{"urban"} | \text{Low})$  respectively are  
 a)  $1/4$ ,  $2/4$  and  $3/4$  b)  $1/4$ ,  $3/4$  and  $0/4$   
 c)  $2/4$ ,  $3/4$  and  $1/4$  d)  $3/4$ ,  $2/4$  and  $1/4$
33. The values of  $P(X=\text{"much"} | \text{High})$ ,  $P(X=\text{"male"} | \text{High})$  and  $P(X=\text{"urban"} | \text{High})$  respectively are  
 a)  $1/4$ ,  $2/4$  and  $3/4$  b)  $1/4$ ,  $3/4$  and  $0/4$   
 c)  $2/4$ ,  $3/4$  and  $1/4$  d)  $3/4$ ,  $2/4$  and  $1/4$



**Question 2: Choose the correct answer (30 Marks):**

21. The process carried out to isolate the human objects from scene images is called  
a) Classification  
b) Clustering  
c) Characterization  
d) mining frequent pattern
22. The entropy of this set  $S_1 = \{A, A, A, B, B\}$  is  
a)  $\text{Ent}(S_1) = 0.971$   
b)  $\text{Ent}(S_1) = 0.651$   
c)  $\text{Ent}(S_1) = 0.918$   
d) None of above
23. we can compute the basic central tendency except the mean value for the ...  
a) Ratio-scale attribute  
b) Ordinal attribute  
c) Nominal attribute  
d) Interval-scale attribute
24. The dissimilarity between the two examples  $x = (1,0,0,0,0,0,0,0,0,0)$  and  $y = (0,0,0,0,0,0,1,0,0,1)$  where the ten attributes are symmetric binary  
a) 0  
b) 0.3  
c) 0.1  
d) 3.5
25. The similarity between the two examples  $x = (0,1,1,1,0,0,0,0,0,0)$  and  $y = (0,0,0,0,0,0,1,0,1,1)$  where the ten attributes are symmetric binary  
a) 0  
b) 0.4  
c) 0.1  
d) 0.7
26. If we have the following list  $A = (9 \ 20 \ 2 \ 13 \ 8 \ 12 \ 4)$ , the value of IQR (Interquartile range) is  
a) 9  
b) 4  
c) 15  
d) 6
27. The entropy of this set  $S_1 = \{A, A, A\}$  is  
a)  $\text{Ent}(S_1) = 0.0$   
b)  $\text{Ent}(S_1) = 0.651$   
c)  $\text{Ent}(S_1) = 0.5$   
d)  $\text{Ent}(S_1) = 1.0$
28. The dissimilarity between  $X = (\text{blue}, \text{Code A}, \text{farmer})$  and  $Y = (\text{red}, \text{Code A}, \text{doctor})$  is  
a) 0.66  
b) 0.0  
c) 0.33  
d) 1.0

|                                                                                   |                                                              |                                                                   |                                            |                                                                                     |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------|
|  | Assiut University<br>Faculty of Science<br>Mathematics Dept. | Final Exam 2024-2025<br>Course: Data Mining<br>Course code: MC464 | Level: Fourth<br>Time: 2 Hours<br>Mark: 50 |  |
| FREE PALESTINE                                                                    |                                                              |                                                                   |                                            |                                                                                     |

"اَسْتَعِزْ بِاللّٰهِ وَلَا تَعْجِزْ"

الامتحان أربع (4) صفحات - بابل شيت

**Question 1: Put True or False for each of the following items (20 Marks)**

1. The dissimilarity between  $X = (\text{blue}, A)$  and  $Y = (\text{red}, A)$  is 0.5 where the attributes described  $X$  and  $Y$  are nominal.
2. In ratio-scale attributes, the value 20 is considered the twice of 10.
3. Ratio-scaled attribute is a numeric attribute with an inherent zero-point or absolute zero.
4. Classification is considered a predictive model.
5. Association rule is kind of knowledge shows the probability of relationships between data items, within large data sets.
6. Bayesian classifier is a class of learning algorithm that tries to find an optimum classification of a set of examples using the probabilistic theory.
7. Data integration is the process of combining multiple data sources in a single database.
8. Regression tends to predict the class label when these labels represent infinite and uncountable values.
9. A major problem with the mean as a statistical representing is its sensitivity to extreme/outlier values.
10. Frequent sequential pattern occurs when customer tend to purchase first something, followed by purchase another something.
11. Outlier values are always discarded in outlier analysis.
12. We can compute the basic central tendency measures except the mean value for the Nominal attribute.
13. Information is an interesting pattern which has meaningful use.
14. The information is the output of the KDD process.
15. Midrange and range are dispersion Measures.
16. When the data distribution is symmetric, the mean, median, and mode are the same value.
17. The value of median is less than the mean when the data is skewed positively.
18. When the data distribution is positively skewed, Small values are more than large values.
19. If an attribute is not discrete, it is continuous.
20. Training data are data objects for which the class labels are known.



33. It support point-to-point messages among pairs of processors.

- a) Ethernet
- b) Switched media
- c) Network Diameter
- d) global communication

34. It can degrade the performance of a heavily utilized shared medium.

- a) Ethernet
- b) Message collisions
- c) Partitioning
- d) global communication

35. The largest distance between two switch nodes.

- a) Ethernet
- b) Switched media
- c) Bisection Width
- d) Network Diameter

---

*End of Exam, with my best wishes:*

**Dr- Abdel-Rahiem Ahmed Hashem Mohammed**

د. عبدالرحيم احمد هاشم محمد

26. which of the following is not a tool to explore the parallelism
- a) Data Dependence Graphs
  - b) Data Parallelism
  - c) Functional Parallelism
  - d) Data clustering
27. In which of the following, new operations adding to allow users to express parallelism
- a) Extend an existing compiler
  - b) Define a new parallel language
  - c) Add a new parallel language layer
  - d) Extend an existing language
28. In a binary tree switch network, if  $8$  is the number of processors then the diameter is
- a) 9
  - b) 4
  - c) 6
  - d) 3
29. In a hypercube switch network, if  $8$  is the number of processors then the diameter is
- a) 5
  - b) 4
  - c) 3
  - d) 6
30. Which of them is not step in Ian Foster methodology
- a) agglomeration
  - b) partitioning
  - c) Selection
  - d) communication
31. The maximum speed up when 90% of a calculation can be parallelized for 10 processors is:
- a) 5.3
  - b) 1.1
  - c) 5
  - d) 3
32. The maximum fraction of a program's parallel execution time that can be spent in serial code if it is to achieve a scaled speedup of 7 on 8 processors is:
- a)  $1/8$
  - b)  $1/7$
  - c)  $3/8$
  - d)  $2/7$



16. In Butterfly switch network topology, for the number of processors  $n$ , the diameter is  $\log(n)$ .
17. In Butterfly switch network topology, for the number of processors  $n$ , the bisection width is  $\sqrt{n}$ .
18. Speedup of the parallel system run time is the ratio between sequential execution time and parallel execution time.
19. One of the most limitations of Gustafson law is its ignoring overhead associated with parallelism.
20. The serial code is the portion of the algorithm that cannot be performed on multiple processors.

**Question No. 2: Choose the correct answer: (30 Marks)**

21. If different functions apply to different or same data, this is called
  - a) Functional Parallelism
  - b) Data Parallelism
  - c) Data clustering
  - d) Data Dependence Graphs
22. Allow only one message at a time to be sent
  - a) Cluster media
  - b) Shared media
  - c) Distributed media
  - d) Switched media
23. Which is better?
  - a) low diameter, low bisection width
  - b) high diameter, high bisection width
  - c) low diameter, high bisection width
  - d) high diameter, low bisection width
24. In a 2-D mesh switch network, the value of bisection width is given from
  - a)  $n \log n$
  - b)  $\log n$
  - c)  $n / 2$
  - d)  $\sqrt{n}$
25. Parallelism in the following sub code
 

```

For i = 0 to 99 do
 c[i] = a[i] + b[i]
Endfor

```

 is considered
  - a) Data Parallelism
  - b) Function Parallelism
  - c) Pipelining
  - d) None of them

|                                                                                   |                                                              |                                                                                 |                                                   |                                                                                     |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------|
|  | Assiut University<br>Faculty of Science<br>Mathematics Dept. | Final Exam 2024-2025<br>Course: Distributed<br>Computing<br>Course code: MC 462 | Level: Fourth<br>Time: 2 Hours<br>Mark: 50 Points |  |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------|

FREE PALESTINE

"استعين بالله ولا تعجز"

الامتحان أربع (4) صفحات - بابل شيت

**Question No. 1: Put True or False:**

**(20 Marks)**

1. The primary reason for the poor speedup when experimentally determined serial fraction  $e$  increases as the number of processors increasing is parallel overhead.
2. The maximum speedup we achieved using Amdahl law is  $1/f$ , where  $f$  is the serial fraction.
3. One of the most disadvantages of Amdahl law is its ignoring the communication time
4. Parallel computing is the use of a parallel computer to reduce the time needed to solve a single computational problem.
5. A parallel computer is a multiple-processor computer system supporting parallel programming
6. In distributed computing system, there is a local memory belongs each CPU.
7. The concurrency is the operations that may be performed in parallel.
8. The primary reason for the poor speedup when experimentally determined serial fraction  $e$  does not change with increasing number of processors is the communication time.
9. The maximum speedup we achieved using Amdahl law is the same value of serial fractional  $f$
10. In parallel computing system, there is a local memory belongs each CPU.
11. Concurrently operations are the operations that may be performed simultaneously.
12. Data dependence graph is a formal way to detect the parallelism.
13. In an extend an existing language approaches, new layer is added on the top of a sequential language to perform the parallelism.
14. Interconnection networks are used to link processors in the sequential system.
15. In direct switch network topology, the ratio of switch nodes to processor nodes is

1:1



[4] What is the output of lexical analyzer?

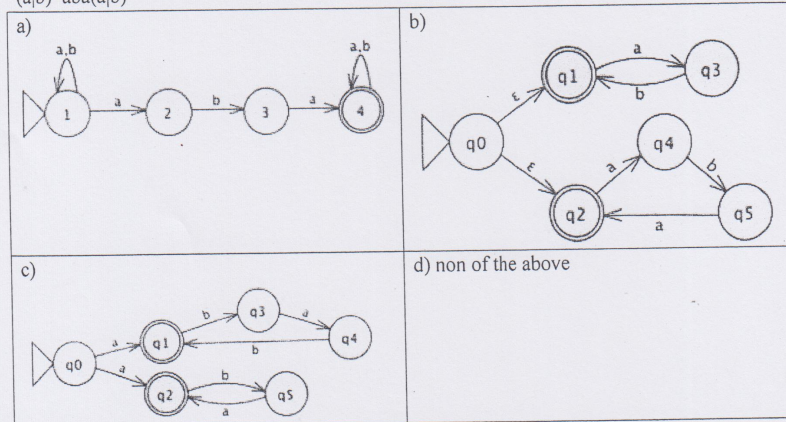
- a) A set of RE
- b) Syntax Tree
- c) Set of Tokens
- d) String Character

[5] Parsing is also known as \_\_\_\_\_

- a) Lexical Analysis
- b) Syntax Analysis
- c) Semantic Analysis
- d) code generation

[6] Construct a NDFA for the following regular expression.

$(a|b)^*aba(a|b)^*$



[7] The following grammar after removal of the left recursion will look like .....

$\text{expr} \rightarrow \text{expr addop term} | \text{term}$

$\text{addop} \rightarrow + | -$

$\text{term} \rightarrow \text{term mulop factor} | \text{factor}$

$\text{mulop} \rightarrow *$

$\text{factor} \rightarrow (\text{expr}) | \text{number}$

A)

$\text{exp} \rightarrow \text{term exp}'$

$\text{exp}' \rightarrow \text{addop term exp}' | \epsilon$

$\text{addop} \rightarrow + | -$

$\text{term} \rightarrow \text{factor term}'$

$\text{term}' \rightarrow \text{mulop factor}$

$\text{term}' | \epsilon$

$\text{mulop} \rightarrow *$

$\text{factor} \rightarrow (\text{expr}) | \text{number}$

B)

$\text{expr} \rightarrow \text{expr addop}$

$\text{term} | \text{term}$

$\text{addop} \rightarrow + | -$

$\text{term} \rightarrow \text{term mulop factor} |$

$\text{factor}$

$\text{mulop} \rightarrow *$

$\text{factor} \rightarrow (\text{expr}) | \text{number}$

C)

$\text{expr} \rightarrow \text{term expr } (+|-) \text{ term}$

$\text{term} \rightarrow \text{term} * \text{factor} |$

$\text{factor}$

$\text{factor} \rightarrow (\text{expr}) | \text{number}$



Computer Science Department  
Faculty of Science  
Assiut University  
Final Exam  
2024-2025 – Jan. 2025

Course: Compiler Theory  
Code: CS412  
4<sup>th</sup> year  
Time: 2 Hours  
Marks: 50

- No. of pages: 3 - No. of questions: 3      answer all questions

**Question 1** (8 pts)

- Describe the steps of applying LL(1) parsing algorithm.
- Construct the top down parsing table for the following grammar, and say whether the grammar is LL(1). (To facilitate partial credit, you may want to show relevant FIRST and FOLLOW sets.)  
 $S \rightarrow aSA \mid Ab \mid \epsilon$   
 $A \rightarrow cA \mid dA \mid \epsilon$

**Question 2** (12 pts)

- A legal string begins with from 1 to 3 a's, is followed by 0 or more b's, c's, or d's, and ends with at least one e.
  - Create a deterministic finite state machine to accept legal strings (and only legal strings).
  - Create a nondeterministic finite state machine to accept legal strings (and only legal strings).
  - Create a regular expression to accept legal strings (and only legal strings).
- Write a regular expression for all strings of a's and b's which contains an odd number of b's.
- Translate the regular expression  
 $(a \mid b \mid c)^* d (e^+) f$   
into a corresponding non-deterministic finite state machine.

**Question 3** (20 pts)

- Which one of the following regular expressions represents the language: the set of all binary strings having two consecutive 0s and two consecutive 1s?
  - $(0|1)^*0011(0|1)^*|(0|1)^*1100(0|1)^*$
  - $(0|1)^*(00(0|1)^*11|11(0|1)^*00)(0|1)^*$
  - $(0|1)^*00(0|1)^*|(0|1)^*11(0|1)^*$
  - $00(0|1)^*11|11(0|1)^*00$
- The RE in which any number of 0's is followed by any number of 1's followed by any number of 2's is?
  - $(0 \mid 1 \mid 2)^*$
  - $0^*1^*2^*$
  - $0^* \mid 1 \mid 2$
  - $(0 \mid 1)^*2^*$
- Which of the following rules is NOT a correct context-free rule, where non-terminals are {A, B}, and terminals are {a, b}
  - $A \rightarrow a \mid Ba$
  - $AB \rightarrow a$
  - $a \rightarrow Ba$
  - Both b and c





**Answer Only Five Questions of the Following**

- 1) If the nonlinear system

$$x_1^2 - 10x_1 + x_2^2 + 8 = 0, \quad x_1x_2^2 + x_1 - 10x_2 + 8 = 0$$

is transformed into the fixed-point problem

$$x_1 = g_1(x_1, x_2) = \frac{x_1^2 + x_2^2 + 8}{10}, \quad x_2 = g_2(x_1, x_2) = \frac{x_1x_2^2 + x_1 + 8}{10}$$

- i) Show that,  $G = (g_1, g_2)^T$  mapping  $D \subset \mathbb{R}^2$  into  $\mathbb{R}^2$  has a unique fixed-point in  $D = (x_1, x_2)^T, 0 \leq x_1, x_2 \leq 1.5$ .  
ii) Apply functional iteration to find  $x^{(1)}$  and  $x^{(2)}$  use  $x^{(0)} = (0.9, 0.8)^T$ .

- 2) Find the least-squares approximation having the form

$$P(x) = c_0 + c_1x + c_2x^2,$$

from the following table:

|   |   |   |   |   |
|---|---|---|---|---|
| x | 0 | 1 | 3 | 4 |
| y | 1 | 0 | 4 | 9 |

then find  $P(1.2)$ .

- 3) a) Construct the Lagrange interpolation polynomial for the function

$$y = \cos(\pi x), \text{ choosing the points: } x_0 = 0, x_1 = \frac{1}{3} \text{ and } x_2 = \frac{1}{2}.$$

b) To what degree of accuracy, we calculate  $\sqrt{117}$  by means of Lagrange's interpolation polynomial for the function  $y = \sqrt{x}$  if we choose the interpolation points  $x_0 = 100, x_1 = 121$ , and  $x_2 = 169$ .

- 4) Reduce the following second order differential equation into two first order differential equations. Then use Euler's method to find  $\phi(0.4)$  for  $h = 0.2$

$$\phi'' + 6 \sin(\phi) = 0, \quad \phi(0) = 1.57, \quad \phi'(0) = 12.56$$

- 5) Use the shooting method to treat with the boundary value problem

$$y'' + y = 0, \quad y(0) = 0, \quad y(1) = 1.$$

Start with the initial approximations  $\alpha_0 = 0.3, \alpha_1 = 0.4$  for  $h = 0.5$ .

- 6) Fit the following points depending on Chebyshev polynomials

|   |                |   |               |
|---|----------------|---|---------------|
| x | $-\frac{1}{2}$ | 0 | $\frac{1}{2}$ |
| y | 1              | 3 | 8             |

Best wishes Prof. Abdalla El-Safy & Dr. Sayed A. Dahy