Sohag University

الكلية حاصلة علي شهادة الاعتماد من الهيئة القومية لضمان جودة التعليم
والاعتماد منذ 2012/7/12 م

Faculty of Science

Final Exam of Advance Differential and Integration (*Course Code 221 math*) for 2-nd 1-st Semester – Academic Year 2022/2023	
Exam date: *24/01/2023* Time: *2 hours* Total mark: *40 marks* Pages: *2*	Examiners: Amal Aboelwafa

Choose the correct answer (40 Marks):

1- The value of $\frac{\partial z}{\partial y} = 8x^2 + 6xy^2 + 4$. What is the function z expressed as?

a) $z = 8x^3 + 2x^2y^2 + 4x$
b) $z = 8x^2y + 2xy^3 + 4y$
c) $z = 8y + 2xy^2 + 4y$
d) $z = 16x + 6y^2$

2- What is the value of $\frac{\partial^2 z}{\partial x \partial y}$ for the $z = 3x^2y + 5$?

a) $3xy$
b) $6x$
c) 3x+5
d) 6xy

3- $f(x,y) = x^3 + xy^2 + 901$ satisfies the Euler's theorem

a) True
b) False

4- If double integral in Cartesian coordinate is given by $\iint_R f(x,y)dxdy$ then the value of same integral in polar form is……..

a) $\iint_p f(r\cos\theta, r\sin\theta)drd\theta$
b) $\iint_p f(r\cos\theta, r\sin\theta)rdrd\theta$
c) $\iint_p f(r\sin\theta, r\cos\theta)drd\theta$
d) $\iint_p f(r\cos\theta, r\sin\theta)r^2drd\theta$

5- For function $f(x,y)$ to have maximum value at (a,b) value is?

a) $rt - s^2 > 0 \ and \ r < 0$
b) $rt - s^2 > 0 \ and \ r > 0$
c) $rt - s^2 < 0 \ and \ r < 0$
d) $rt - s^2 < 0 \ and \ r > 0$

6- Necessary condition of Euler's theorem is

a) z should be homogenous and of order n
b) z should not be homogenous but of order n
c) z should be implicit
d) z should be the function of $x \ and \ y$ only

7- Consider the $f(x,y) = x^2 + y^2 - a$ for what values of a do we have critical point for the function

a) For any real number except zero
b) Independent of a
c) $a \in (0, \infty)$
d) $a \in (-1, 1)$

8- The value of $\int_0^{2\pi}\int_0^{\frac{\pi}{2}}\int_0^1 r^2 sin\theta\, drd\theta d\emptyset$ will be.....

a) $\frac{\sqrt{2}\pi}{3}(\sqrt{2}+\sqrt{3})$
b) $\frac{2\pi}{3}(\sqrt{2}-\sqrt{3})$
c) $\frac{\sqrt{2}\pi}{3}(\sqrt{2}-1)$
d) otherwise

9- The value of C such that the function $f(x,y)=\begin{cases}\frac{x^2+2y}{x+y^2}, & (x,y)\neq(1,2)\\ C & (x,y)=(1,2)\end{cases}$ is continuous is

a) -1
b) 0
c) 1
d) otherwise

10- $f(x,y)=x^2+xyz+z$ Find f_x at $(1,1,1)$

a) 0
b) 1
c) 3
d) otherwise

11- $f(x,y)=sin(x)+cos(y)+xy^2;\ x=cos(t);\quad y=sin(t)$ Find $\frac{df}{dt}$ at $t=\frac{\pi}{2}$

a) 2
b) -2
c) 1
d) otherwise

12- . If $z=xy\,ln(xy)$, then

a) $xz_x+yz_y=0$
b) $xz_x=yz_y$
c) $yz_x+xz_y=0$
d) otherwise

13- $f(x,y)=sin(xy)+x^2\,ln(y)$ Find f_{xy} at $(0,\frac{\pi}{2})$

e) 0
f) 1
g) 3
h) otherwise

14- Discuss minimum value of $f(x,y)=x^2+y^2+6x+12$

a) 9
b) -3
c) 3
d) -9

15- $\int_2^3\int_x^{x^2}(x+3y)dxdy$

a) Ture
b) False

Let $I=\int_{x=0}^1\int_{y=0}^{x^2}xydydx$

16- Then, I may also be expressed as

a) $\int_{y=0}^1\int_{x=0}^{\sqrt{y}}xydxdy$
b) $\int_{y=0}^1\int_{x=0}^{y}xydxdy$
c) $\int_{y=0}^1\int_{x=\sqrt{y}}^1xydxdy$
d) otherwise

17- The value of the integration is

a) $\frac{1}{6}$
b) $\frac{1}{12}$
c) $\frac{1}{18}$
d) otherwise

Area enclosed between the straight line $y = x$ and the parabola $y = x^2$

18- The intersection points are

a) $(0,0),(-1,1)$
b) $(0,1),(0,2)$
c) $(0,0),(1,1)$
d) otherwise

19- Then the integration

a) $\int_0^1 \int_x^{x^2} dydx$
b) $\int_0^1 \int_{x^2}^x dydx$
c) $\int_0^1 \int_{x^2}^x dxdy$
d) otherwise

20- The value of integration is

a) $\frac{1}{6}$
b) $\frac{1}{3}$
c) $\frac{1}{2}$
d) otherwise

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My best wishes

Final Exam of Probability Theory 1 (*Course Code: MATH241*)

for 2-nd level students credit hours – Mathematical Statistics and Programming program

1-st Semester – Academic Year 2022/2023

Exam date: *10 / 01/ 2023* **Time**: *2 hours*	**Examiner**: **Dr. Alwageh A. Farghal**
Total mark: *40 marks* **Pages**: *2*	

SPECIAL INSTRUCTIONS: CALCULATOR IS PERMITTED;

Answer the Following Questions: *[40 Marks, 2.0 points each]*

Choose the correct answer:

1- The set of all possible outcomes of an experiment is called the……

(A) events (B) Sample Space (C) Random experiment (D) None of these

2-If A and B are mutually exclusive events, then: $P(A - B) = \cdots$

(A) $P(B) - P(A \cap B)$ (B) $P(B)$ (C) $P(A)$ (D) None of these

3-If the events A and B are independent, then: P(B | A) = ……

(A) $P(A)$ (B) $P(B)$ (C) $\frac{P(A \cap B)}{P(B)}$ (D) None of these

4- If the events A and B mutually exclusive events, then: P(A | B) =…….

(A) 0 (B) ∅ (C) $\frac{P(A \cap B)}{P(A)}$ (D) None of these

5- The Cumulative distribution function F(x), then $\lim_{x \to -\infty} F(x) = \cdots$

(A) 1 (B) 0 (C) $-\infty$ (D) None of these

The events A, B and C have probabilities $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$, $P(C) = \frac{1}{4}$.

Furthermore, A∩C = ϕ, B∩C = ϕ and P(A∩B) = $\frac{1}{6}$:

6- The $P(A \cap B^c)$ =……

(A) $\frac{11}{14}$ (B) $\frac{7}{6}$ (C) $\frac{1}{3}$ (D) None of these

7- The $P(A \cup B \cup C)$ =……

(A) $\frac{11}{12}$ (B) $\frac{13}{12}$ (C) $\frac{10}{12}$ (D) None of these

8- The $P(A^c \cap B^c)$ =……

(A) $\frac{11}{14}$ (B) $\frac{2}{3}$ (C) $\frac{1}{3}$ (D) None of these

9- The $P(B \cap A^c)$ =……

(A) $\frac{11}{14}$ (B) $\frac{1}{6}$ (C) $\frac{1}{3}$ (D) None of these

A shipment of 8 similar microcomputers to a retail outlet contains 3 that are defective. If a school makes a random purchase of 2 of these computers.

10- The probability that two of these computers is defective is

(A) $\frac{2}{3}$ (B) $\frac{3}{28}$ (C) $\frac{3}{8}$ (D) None of these

A discrete random variable x has a probability mass function given by:

$$P(x) = c(x+1), \qquad x = 0,1,2,3.$$

11- The value of the constant c equals…..

(A) 0.1 (B) 0.15 (C) 0.5 (D) None of these

12- The $P(0 \leq x < 2)$ equals……

(A) 0.6 (B) 0.3 (C) 0.5 (D) None of these

13- The expected value of Y , where $Y = 5x + 2$

(A) 2 (B) 10 (C) 12 (D) None of these

14- The variance of Y , where $Y = 5x + 2$

(A) 5 (B) 25 (C) 125 (D) None of these

-A random variable X is a Poisson distribution with Parameter λ, then:

15- The mean equals …..

(A) $n\lambda$ (B) λ (C) 2λ (D) None of these

16- The variance equals …..

(A) λ (B) $n\lambda$ (C) λ^2 (D) None of these

17- The moment generating functions equals …..

(A) $e^{\lambda}(e^t - 1)$ (B)e^{λ} (C) $e^{\lambda(e^t-1)}$ (D) None of these

18-A random variable X has a Poisson distribution with a mean of 3. The probability that: $P(1 \leq X \leq 3)$ equals …..

(A) 12 (B) $12\, e^{-3}$ (C) $3\, e^{-3}$ (D) None of these

19- Let X have a Poisson distribution with parameter $\lambda = 1$. The probability that $X \leq 2$ given that $X \geq 4$ equals …..

(A) $\frac{17}{65}$ (B) $\frac{17e^{-1}}{65}$ (C) 0 (D) None of these

20- Afair coin is tossed 12 times:

The probability of getting five heads and seven tails equals….

(A) 0.13369 (B) 0.19336 (C) 0.16339 (D) None of these

My best wishes with success ******** ***** **Dr. Alwageh. A. Farghal**, 2023

Final Exam of Linear algebra (*Course Code223 math*) for 2-nd 1-st Semester – Academic Year 2022/2023	
Exam date: *26/01/2023* Time: *2 hours* Total mark: *40 marks* Pages: *2*	Examiners: Amal Aboelwafa

Choose the correct answer (40 Marks):

1- Which of the following elementary operations has been applied to the matrix $A = \begin{bmatrix} 8 & 5 \\ 2 & 8 \end{bmatrix}$ such that the new matrix is $\begin{bmatrix} 12 & 21 \\ 2 & 8 \end{bmatrix}$?

a) $R_1 \to R_1 - 2R_2$ b) $R_1 \to 2R_1 + R_2$
c) $R_1 \to R_1 + R_2$ d) $R_1 \to R_1 + 2R_2$

2- Which of the following column operation is incorrect for the matrix $\begin{bmatrix} 1 & 2 & 5 \\ 6 & 3 & 8 \end{bmatrix}$?

a) $C_1 \to 3C_1$ b) $C_2 \to C_1 + C_2$
c) $C_2 \to 2C_1 + 2C_2 - C_3$ d) $C_2 \to 2 + 2C_2$

3- Which of the following matrices will not have an inverse?

a) $\begin{bmatrix} 2 & 4 \\ -1 & 1 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 5 & 3 \\ 6 & 4 & 2 \\ 1 & 3 & 2 \end{bmatrix}$

c) $\begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix}$ d) $\begin{bmatrix} 1 & 2 & 5 \\ 3 & 6 & 4 \end{bmatrix}$

4- The condition for which the eigenvalues of the matrix $A = \begin{bmatrix} 2 & 1 \\ 1 & k \end{bmatrix}$ are positive, is

a) $k < \frac{1}{2}$ b) $k > \frac{1}{2}$
c) $k = 0$ d) otherwise

5- Which of the following conditions holds true for a system of equations to be consistent

a) It should have one or more solutions b) It should have no solutions
c) It should have exactly one solution d) It should have exactly two solutions

6- The inverse of a matrix is unique

a) Ture

b) False

7- Find the values of x, y, z and w from the below condition

$$5\begin{bmatrix} x & z \\ y & w \end{bmatrix} = \begin{bmatrix} 2 & 10 \\ 3 & 2x+y \end{bmatrix} + \begin{bmatrix} z & 5 \\ 7 & w \end{bmatrix}$$

a) $x = 1, y = 3, z = 2, w = 1$
b) $x = 1, y = 2, z = 3, w = 1$
c) $x = 1, y = 3, z = 2, w = 0$
d) otherwise

8- Let $V = R^4$ and consider the following subset of V:

$$W = \{(x_1, x_2, x_3, x_4) \in R^4 \mid 2x_1 - 3x_2 + x_3 - 7x_4 = 0\}$$

is W a subspace of V

a) Ture
b) False

9- If $A = \begin{bmatrix} cos\alpha & -sin\alpha \\ sin\alpha & cos\alpha \end{bmatrix}$ and $A + A^T = I$ then the value of α is

a) $\frac{\pi}{6}$
b) $\frac{\pi}{3}$
c) π
d) otherwise

10- If two vectors u and v are orthogonal if and only if $\|u+v\|^2$=

a) $\|u\|^2 - \|v\|^2$
b) $\|u\|^2 + \|v\|^2$
c) $\|u\|^2 + 2\|u\|\|v\| + \|v\|^2$
d) otherwise

11- The rank of the matrix $(m \times n)$ where $m < n$ cannot be more than?

a) m
b) n
c) $m - n$
d) $m * n$

12- If A is an $n \times n$ matrix, then $(AA^T)^T$ equal

a) A
b) AA^T
c) A^TA
d) otherwise

13- The given system of equation is inconsistent.

$$4x + 2y = 7,$$
$$6x + 3y = 9$$

a) True
b) False

14- Let W be a subspace of a vector space V. A set of vectors $\beta = \{v_1, \dots\dots, v_k\}$ in W is said to be a basis for W if

a) Span and linear dependent
b) Linear dependent
c) Linear combination
d) otherwise

Let $A = [v_1 \ v_2 \ v_3] = \begin{bmatrix} 0 & 1 & 4 \\ 1 & 2 & -1 \\ 5 & 8 & 0 \end{bmatrix}$

15- The rank of A

a) 2
b) 3
c) 1
d) otherwise

16- The vectors $\{v_1, v_2, v_3\}$ are linearly dependent

a) Ture
b) False

Let $A = \begin{bmatrix} 1 & 0 & 0 \\ 6 & -2 & 0 \\ 7 & -4 & 2 \end{bmatrix}$

17- Then the eigenvalues are

a) $1, 2, 3$

b) $-2, 1, 2$

c) $-1, 1, 2$

d) otherwise

18- Then the eigenvectors are $P = [X_1, X_2, X_3]$

a) $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 2 & 0 \\ 1 & 1 & 1 \end{bmatrix}$

b) $\begin{bmatrix} 1 & 0 & 0 \\ 3 & 2 & 0 \\ 1 & 1 & 1 \end{bmatrix}$

c) $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 1 & 2 \end{bmatrix}$

d) otherwise

19- Find P^{-1} such that $P^{-1}AP$

a) $\begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 1 & -1 & 1 \end{bmatrix}$

b) $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 2 & 1 \\ 1 & 0 & 1 \end{bmatrix}$

c) $\begin{bmatrix} -2 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & -1 & 1 \end{bmatrix}$

d) otherwise

20- Find the diagonal matrix such that $P^{-1}AP$

a) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$

b) $\begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2 \end{bmatrix}$

c) $\begin{bmatrix} -2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2 \end{bmatrix}$

d) otherwise

My best wishes

Final Exam of Abstract Algebra (Course Code: MATH321)

for 3rd level students *credit hours* – Mathematics program

1st Semester – Academic Year 2022/2023

Date: Saturday, 14 /1/2023 Time: 2 hours The Exam in **3** pages

Degree: 50 Marks Examiners: Dr. Mohammed Abuelhassan Saleem

Answer the following questions

Question I: Choose the correct answer (30 Marks, 1.5 Mark for each)

1. For two Groups $(G,*)$ and $(G',*')$ to be isomorphic, there must be exist ..... map $\varphi : S \to S'$ such that φ is bijective.

   (a) an injective (b) a surjective (c) a homomorphism (d) one

2. Two binary structures $(S,*)$ and $(S',*')$ are not isomorphic if they ..... .

   (a) are not homomorphic (b) do not have the same property

   (c) one of (a) or (b) (d) nothing of (a) and (b)

3. The solution of the equation $x^2 + x - 2 = 0$ in $\mathbb{Z}_3$ are ..... .

   (a) $1,1$ (b) $2,2$ (c) $1,2$ (d) $0,1$

4. A binary operation $*$ on a set G is ..... if $a * b = b * a$ for all $a, b \in G$.

   (a) abelian (b) distributive (c) closed (d) associative

5. A trivial subgroup H of the group $(G,*)$ is ....., where e is the identity element in G.

   (a) $H \neq G$ (b) $H = G$ (c) $H \neq \{e\}$ (d) $H = \{e\}$

6. The statement "Every group is isomorphic to a group of permutations" is called ..... Theorem.

   (a) Lagrange's (b) Able's (c) Cayley's (d) Hilbert's

7. The automorphism of groups is a type of the ..... of the groups.

   (a) homomorphism (b) isomorphism (c) bijection (d) injection

8. Every group has ..... a non trivial subgroup.

   (a) at least (b) exactly (c) at most (d) mor than

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9. Any cyclic group of infinit order is isomorphic to the group ..... .

(a) $(\mathbb{Z},+)$ (b) $(\mathbb{Z}_n,\oplus_n)$ (c) $(\mathbb{Z},\oplus_n)$ (d) $(\mathbb{Z}_n,+)$

10. The orders of the sets of left cosets and right cosets of a subgroup H in any group G are ..... .

(a) not equal (b) equivalent (c) coincide (d) the same

11. The Aultrenating group A_n of a group S_n is containing ..... permutations in S_n.

(a) all the even (b) all the odd (c) a subset (d) no

12. A permutation is ..... map between A and itself.

(a) a bijective (b) an injective (c) an isomorphism (d) a homomorphism

13. Two positive integers r and s are relatively prime if ..... .

(a) $(r,s)=1$ (b) $(r,s)\neq 1$ (c) $(r,s)>1$ (d) $(r,s)<1$

14. There is only one of the following statements is true which is ..... .

(a) every finite group is cyclic (b) every finite integral domain is a field
(c) every ring is commutative (d) every complete ring is a field

15. There is only one ..... of the group of the symmetries of an equilateral triangle that is normal.

(a) subset (b) subgroup (c) semi group (d) cycle

16. The unit element of a ring R is the element $a\in R$ that has ..... in R.

(a) a factor (b) a divisor (c) an inverse (d) a unity

17. Let H be a subgroup of a finite group G, and let r and m be the orders of H and G, respectively. Then Lagrange's theorem is that ..... .

(a) $r=m$ (b) $r\mid m$ (c) $r>m$ (d) $(r,m)=1$

18. A commutative division ring R called ..... .

(a) a strictly skew field (b) a skew field (c) a field (d) nothing of the previous

19. The kernel of the ring homomorphism $\phi:(\mathbb{Z},+,\cdot)\longrightarrow(\mathbb{Z}_n,+,\cdot)$ is ..... .

(a) $\mathbb{Z}_n$ (b) $n\mathbb{Z}$ (c) $\mathbb{Z}^n$ (d) $\mathbb{Z}$

20. Any integral domain ..... .

(a) satisfies the cancellation laws (b) has no zero divisors
(c) both (a) and (b) (d) nothing of (a) and (b)

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Question II: Mark each of the following true or false (20 Mark, one Mark for each)

(1) If every element is the inverse of itself in a group G, then G is abelian group.

(2) If $*$ is any associative binary operation on any set S, then $a*(b*c)=(b*c)*a$ for all $a,b,c\in S$.

(3) A map $\varphi:(S,*)\to(S',\circ)$ is bijective if and only if it is a one-t-one correspondence between $(S,*)$ onto $(S',\circ)$.

(4) The most common binary operations defined on sets are those defined on the sets numbers.

(5) In any group, there are at least two subgroups.

(6) The canccellation law is satisfied in any group.

(7) Every cyclic group is not abelian.

(8) A cyclic group may be have more than one generator.

(9) Every finite group of at most three elements is abelian.

(10) Every cyclic subgroup of a group is normal.

(11) Any subset of a group is a subgroup under the induced operation.

(12) The identity element of the factor groug G/H is H.

(13) The product of two integral domains is an integral domain.

(14) Every infinite cyclic group is isomorphic to $(\mathbb{Z},+)$.

(15) The group of permutations A_3 is cyclic.

(16) Every bijective function is a permutation.

(17) The map $\phi:(\mathbb{Z},+,\cdot)\longrightarrow(2\mathbb{Z},+,\cdot)$, with $\phi(r)=2r,\forall r\in\mathbb{Z}$, is a ring isomorphism.

(18) Every ring with unity has at most two units.

(19) The ring $(n\mathbb{Z},+,\cdot)$ has no zero divisors.

(20) The algebraic structure $(\mathbb{Z}_n,+,\cdot)$, n is a prime number $<\infty$ is a field.

With all my best wishes.
Dr. Mohammed Abuelhassan Saleem