

Mid-West University
Examinations Management Office

End Semester Exam-2082

B.Ed. Level / III Semester

Sub: Discrete Mathematics (MATH434/334)

Roll No.

Group 'A'

10×1=10

Tick (✓) the Best Answer.

1. How many middle terms are there in the expansion of $(x+3y)^7$?

- | | |
|------|------|
| a. 1 | b. 2 |
| c. 3 | d. 4 |

2. In how many ways can 4 people take their seat in a round table?

- | | |
|-------|-------|
| a. 6 | b. 4 |
| c. 12 | d. 24 |

3. Which of the followings is true?

- | | |
|------------------------------|------------------------------|
| a. $np_r = \frac{n c_r}{r!}$ | b. $n c_r = \frac{np_r}{r!}$ |
| c. $nc_r = np_r$ | d. $nc_r = \frac{np_r}{2!}$ |

4. Which of the followings represents the set $A-B$?

- | | |
|------------------------------------|---------------------------------|
| a. $\{x: x \notin A, x \in B\}$ | b. $\{x: x \in A, x \notin B\}$ |
| c. $\{x: x \notin A, x \notin B\}$ | d. $\{x: x \in A, x \in B\}$ |

5. The value of ceiling function $\lceil 3.2 \rceil$ is ...

- | | |
|------|------|
| a. 3 | b. 4 |
| c. 2 | d. 1 |

6. In a finite state machine $M = (S, I, O, f, g, s)$ consists O represents...

- | | |
|--------------------|----------------------|
| a. output function | b. ordered pair |
| c. optimal value | d. none of the above |

7. The generating function $\sum_{k=0}^{\infty} a^k x^k$ equals to...

- | | |
|---------------------|---------------------|
| a. $\frac{1}{a-x}$ | b. $\frac{1}{1-ax}$ |
| c. $\frac{1}{1-ax}$ | d. $\frac{1}{1-x}$ |

8. If $a_n = 2a_{n-1} + a_{n-2}$ is any recurrence relation and $a_0 = 0, a_1 = 2$, what is the value of a_2 ?

- | | |
|------|------|
| a. 3 | b. 6 |
| c. 4 | d. 5 |

9. How terms are there in the union of 6 sets?

- | | |
|-------|-------|
| a. 64 | b. 63 |
| c. 36 | d. 30 |

10. A derangement is a permutation of objects that leaves...

- | | |
|--|---|
| a. all objects in the original position. | b. some objects in the original position. |
| c. no objects in the original position. | d. two objects in the original position. |

Mid-West University
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End Semester Exam-2082

Level: B.Ed. / III Semester

FM: 60

Time: 3 hrs.

PM: 30

Sub: Discrete Mathematics (MATH434/334)

Candidates are requested to give their answers in their own words as far as practicable.

Attempt All the Questions.

Group 'B'

6 × 5 = 30

1. Using Binomial theorem, find the coefficient of $x^{12}y^{13}$ in the expansion of $(x - 2y)^{20}$.
2. Differentiate between permutation and combination with example.
3. Construct a conditional statement and write down its converse, inverse and contrapositive. Also, prove that the converse is logically equivalent to inverse.

Or

Define logical equivalence of propositions and prove that $p \leftrightarrow q$ and $(p \rightarrow q) \wedge (q \rightarrow p)$ are logically equivalent.

4. What is mathematical induction? Conjecture the formula for the sum of first n natural number and prove it by induction method.
5. Define the composite and inverse function. Find $\log^{-1}(-1)$ if $f(x) = \frac{3x-2}{4}$ and $g(x) = \frac{1-2x}{3}$
6. Define finite state machine. Construct a derivation tree for the sentence 'A barking dog seldom bites'.

Or

Let $V = \{S, A, B, a, b\}$ be the vocabulary. $T = \{a, b\}$ is the set of terminals. Find the language generated by the grammar (V, T, S, P) when the set of productions consists of i. $S \rightarrow AB$, $S \rightarrow AA$, $A \rightarrow aB$, $A \rightarrow ab$, $B \rightarrow b$

Group 'C'

2 × 10 = 20

7. State the principle of inclusion-exclusion. Using this find the number of elements of the union of four sets if each of the set has 50 elements, each pair of the sets has 40 elements, each three of the sets has 20 elements and there are 10 elements common in all four sets.
8. Suppose that the number of bacteria in a colony triples every hour.
 - i. Set up a recurrence relation for the number of bacteria after n hours have elapsed.
 - ii. If 100 bacteria are used to begin a new colony, how many bacteria will be in the colony in 10 hours?

Or

Define recurrence relation. Assume that the population of the world in 2002 was 6.2 billions and is growing at the rate of 1.3% a year.

- i. Set up a recurrence relation for the population of the world after n year.
- ii. Find the population of the world in 2022.

THE END