MODEL QUESTION PAPER OF MATHEMATICS-I

For Diploma in Information Technology (DIT 02 year)

DIT Semester-II (1st year)

(OBJECTIVE) PART-A

Time Allowed: 60 Minutes **Marks:** 50

Instructions:

- This part consists of **50 MCQs** of **1 mark each**.
- Attempt all questions.

Multiple Choice Questions (MCQs)

1. $(-1)^{\frac{-21}{2}}$ equals _____
   a) i b) $-i$ c) 1 d) -1
2. *if* $z = -7 - 24i$ then real part of $\sqrt{z}$ is:
   a) 2 b) 3 c) 4 d) 1
3. The roots of $z^2 + 9 = 0$ are:
   a) $3, -3$ b) $3i, -3i$ c) $-3i, -3i$ d) 9, -9
4. $a^2 + b^2$ has factors:
   a) $(a+b)(a-b)$ b) $(a+b)(a-ib)$ c) $(a+ib)(a-ib)$ d) $(a+ib)(a-b)$
5. If $y = f(x)$is a function, then y is called
   a) Dependent variable b) Independent variable
   c) Co-domain d) Domain
6. The output of a function is also called:
   a) Result b) Domain c) Image d) None of these
7. A function which is onto called:
   a) Injective b) Bijective c) Surjective d) Into
8. The quadratic function is a polynomial function of degree:
   a) 0 b) 2 c) 1 d) 3
9. Which of the following represents a quadratic function?
   a) $y = x^3$ b) $y = x^2 + x + 1$ c) $y = \sqrt{x}$ d) $y = \frac{1}{x}$
10. A quadratic function $f(x) = ax^2 + bx + c$ has maximum or minimum value at:
    a) $x = \frac{b}{2a}$ b) $x = -\frac{b}{2a}$ c) $x = \frac{b}{a}$ d) $x = -\frac{b}{a}$
11. The elements of principle diagonal of a matrix $A = [a_{ij}]_{3\times3}$
    a) a_{21}, a_{22}, a_{23} b) a_{11}, a_{22}, a_{33} c) a_{13}, a_{22}, a_{23} d) None of these
12. A square matrix A in which all the elements are zero except diagonal elements is called:
    a) diagonal b) symmetric c) skew symmetric d) None of these
13. A square matrix A is said to be singular if:
    a) $|A| = 1$ b) $|A| = 0$ c) $|A| \neq 0$ d) None of these
14. If A is a matrix of order 3×2, then order of A^tA is:
    a) 2×2 b) 2×3 c) 3×3 d) 3×2
15. The fractions obtained from a single rational fraction are called:
    a) Partial fractions b) Improper fractions
    c) Rational fraction d) None of these
16. The conditional equation $\frac{x-1}{3} = 2$, holds if x is equal to:
    a) 8 b) 7 c) 5 d) 6
17. $x^2 + x - 6 = 0$is:
    a) Identity b) Condition equation c) Cubic equation d) None of these
18. The next two terms of the sequence $1, 3, 7, 15, 31 \ldots\ldots$ are :
    b) 112, 288 b) 63, 127 c) 102, 188 d) None of these
19. A sequence $\{a_n\}$ in which $a_n - a_{n-1}$ is the same number $\forall\ n \in N$ and $n > 1$, is called:
    b) A.P b) G.P c) H.P d) None of these

20. Geometric mean between $-2i$ and $8i$ is:
b) ± 4 b) ± 3 c) ± 2 d) ± 1

21. $n(n-1)(n-2)(n-3)\ldots.3.2.1 =$
a) $n!$ b) $(n-1)!$ c) $(n+1)!$ d) None of these

22. *if* ${}^{n}P_{2} = 30$, What is the value of 'n' is:
a) 4 b) 5 c) 6 d) 2

23. The statement $S(n) = n^2 - n + 41$ is prime number for every natural number n except:
a) $n = 11$ b) $n = 21$ c) $n = 31$ d) $n = 41$

24. For any positive integer n, $2 + 6 + 18 + \cdots + 2 \times 3^{n-1} =$
a) 3^n b) $3^n + 1$ c) $3^n - 1$ d) $3^n - 3$

25. A polynomial of degree zero is called:
a) Linear b) Quadratic c) Constant d) None of these

26. If $x - 2$ is a factor of $ax^2 - 12x + 4$, then $a = ?$
a) 2 b) 5 c) 7 d) 0

27. The distance between points $(3, 8)$ and $(5, 6)$ is:
a) $\sqrt{2}$ b) $2\sqrt{2}$ c) 1 d) 2

28. $Sin\left(\alpha - \frac{\pi}{2}\right) =$
a) $Sec\ \alpha$ b) $-Cos\ \alpha$ c) $Cos\ \alpha$ d) $-Sin\ \alpha$

29. $Cos\ (\alpha - \beta) =$

a) $Cos\ \alpha\ Cos\ \beta - Sin\ \alpha\ Sin\ \beta$ b) $Cos\ \alpha\ Cos\ \beta + Sin\ \alpha\ Sin\ \beta$

c) $Sin\ \alpha\ Cos\ \beta + Cos\ \alpha\ Sin\ \beta$ d) $Sin\ \alpha\ Cos\ \beta - Cos\ \alpha\ Sin\ \beta$

30. $Sin\ 5\theta\ Cos\ 2\theta =$

a) $Sin\ 7\theta - Sin\ 3\theta$ b) $\frac{1}{2}[Sin\ 7\theta - Sin\ 3\theta]$

c) $\frac{1}{2}[Sin\ 7\theta + Sin\ 3\theta]$ d) None of these

31. A function $f(x)$ is odd if
a) $f(x) = f(-x)$ b) $f(-x) + f(x) = 0$ c) $f(x) > 0$ d) $f(x) = c$

32. The period of $Tan\ 5x$ is:
a) π b) 2π c) $\frac{\pi}{5}$ d) $\frac{2\pi}{5}$

33. Domain of function $y = Cos\ x$ is:
a) $0 < x < \pi$ b) $-1 \leq y \leq 1$ c) $-\infty < x < \infty$ d) $-\infty < x < 0$

34. Range of $tan\ x$ is:
a) $(-1, 1)$ b) $[-1, 1]$ c) $[0,\ 1]$ d) $(-\infty,\ \infty)$

35. π is period of:
a) $Sin\ \theta$ b) $Cos\ \theta$ c) $Sec\ \theta$ d) $Cot\ \theta$

36. $\lim_{x\to 3}(2x + 4) =$
a) 0 b) 3 c) 10 d) 4

37. $\lim_{n\to\infty}\left(1 + \frac{1}{n}\right)^{n} =$
a) e b) ∞ c) 0 d) None of these

38. $\lim_{x\to 0}\frac{Sin\ 7x}{x} =$
a) ∞ b) $\frac{1}{7}$ c) 7 d) 1

39. $f(x) = \frac{x^2-9}{x-3}$ where $x \neq 3$ is discontinuous at $x = 3$ because:
a) $\lim_{x\to 3} f(x) = f(3)$ b) $f(3)$ is not defined
c) $\lim_{x\to 3} f(x)$ does not exist d) None of these

40. $\lim_{x\to\infty}\left(\frac{x}{1+x}\right)^{x} =$
a) e b) $\frac{1}{e}$ c) e^{-2} d) 1

41. $\lim_{x\to a} \frac{f(x)-f(a)}{x-a} =$

a) $f'(x)$ b) $f'(a)$ c) $f'(0)$ d) $f'(2)$

42. Notation for derivative was used by Newton is:

a) $\frac{dy}{dx}$ b) $Df(x)$ c) $f'(x)$ d) $\dot{f}(x)$

43. $\frac{d}{dx}(x^2+1) =$

a) x b) $2x$ c) $\frac{x}{2}$ d) 1

44. If $f(x) = \frac{2}{x^3}$ then $f'(2) =$

a) 1 b) 0 c) -1 d) ∞

45. $\frac{d}{dx}(c^3) =$

a) $3c^2$ b) 1 c) 0 d) c

46. A physical quantity that has both magnitude and direction is called:

a) Variable b) Vector c) Scalar d) None of these

47. The unit vector along x-axis is:

a) $\underline{i}$ b) $\underline{j}$ c) $\underline{k}$ d) None of these

48. The Position vector of a point $P(-1,2,3)$ is:

c) $\underline{i} - 2\underline{j} - 3\underline{k}$ b) $\underline{i} + 2\underline{j} + 3\underline{k}$ c) $-\underline{i} + 2\underline{j} + 3\underline{k}$ d) $-\underline{i} - 2\underline{j} - 3\underline{k}$

49. Norm of a vector $\underline{u} = [3,-4]$ is:

c) 25 b) 5 c) -5 d) ± 5

50. If vectors $\underline{i} - 3\underline{j} + 4\underline{k}$ and $\alpha\underline{i} + 9\underline{j} - 12\underline{k}$ are parallel then:

c) $\alpha = 1$ b) $\alpha = -3$ c) $\alpha = 3$ d) $\alpha = \frac{1}{3}$

MODEL QUESTION PAPER OF MATHEMATICS-I

For Diploma in Information Technology (DIT 02 year)

DIT Semester-II (1st year)

(SUBJECTIVE) PART-B

Time Allowed: 2 Hour **Marks:** 50

SECTION-I

Attempt any **13** questions out of **18**. $(13 \times 2 = 26)$

i. Find the sum and product of the complex numbers (8, 9) and (5,-6).

ii. Factorize the polynomial into its linear factor $z^3 + 8$.

iii. Find $\frac{f(a+h)-f(a)}{h}$ and simplify where, $f(x) = 4x + 7$.

iv. Solve the absolute value quadratic equation $|x^2 + 1| = 5$.

v. Define Matrix with example.

vi. Without expansion show that the determinant of the given matrix $\begin{bmatrix} 7 & 8 & 9 \\ 5 & 6 & 7 \\ 2 & 3 & 4 \end{bmatrix}$ is zero.

vii. Define Rational Fraction.

viii. Find the next four terms of the sequence $12, 16, 20, \ldots$

ix. Find n, if $(n + 4)! = 3024 \times n!$

x. Use mathematical induction to prove $2 + 5 + 8 + \cdots + (3n - 1) = \frac{n}{2}(n + 1)^2$ formula for positive integer n.

xi. Define Remainder Theorem.

xii. Prove that: $Sin(180^o + \alpha)\, Sin(90^o + \alpha) = -Sin\, \alpha\, Cos\, \alpha$

xiii. Find the period of $Sin\, 5x$.

xiv. Evaluate $\lim_{x \to 3}(2x + 4)$ by using theorems of limits:

xv. Express $\lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^{2n}$ in terms of e.

xvi. Find the gradient and equation of the tangent line to $y = 3x^2 - 4x + 1$ at $x = 2$.

xvii. Differentiate $x^4 + 2x^3 + x^2$ with respect to x.

xviii. For the vectors, $v = [2,1,3]$ and $w = [-1,4,0]$ find $|v - 2w|$.

SECTION-II

Instructions: Attempt any 3 questions out of 5. **(3 × 8 = 24)**

Q.1 a) Solve: $2z^2 - 3z + 4 = 0$ (Complex quadratic equation) by completing square method.

b) Given $f(x) = x^3 - ax^2 + bx + 1$. If $f(2) = -3$ and $f(-1) = 0$. Find the values of a and b.

Q.2 a) If $A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & -5 & 0 \\ -2 & -2 & 7 \end{bmatrix}$, then find: A_{13}, A_{23}, A_{33} and $|A|$.

b) For what value of n, $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ is the A.M. between a and b, where $a \neq b$.

Q.3 a) Prove that: ${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$

b) Find the coefficient of x^5 in the expression of $\left(x^2 - \frac{3}{2x}\right)^{10}$

Q.4 a) Prove that : $Cos\ 20^o\ Cos\ 40^o\ Cos\ 60^o\ Cos\ 80^o = \frac{1}{16}$

b) $f(x) = \begin{cases} \frac{\sqrt{2x+5} - \sqrt{x+7}}{x-2} & , \quad x \neq 2 \\ k & , \quad x = 2 \end{cases}$

Find value of k so that f is continuous at $x = 2$.

Q.5 a) If $y = x^4 + 2x^2 + 2$, Prove that $\frac{dy}{dx} = 4x\sqrt{y-1}$

b) If $\underline{a} + \underline{b} + \underline{c} = 0$, then prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$

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