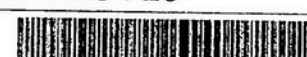## OBJECTIVE

NOTE: You have four choices for each objective type question as A , B , C and D . The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question.

QUESTION NO. 1   DGK-1-24

1 Factorial form of $(n+1)(n)(n-1)$ is

(A) $\frac{(n+1)!}{(n-2)!}$ (B) $\frac{(n-2)!}{(n+1)!}$ (C) $\frac{(n+1)!}{n!}$ (D) $\frac{n!}{(n+1)!}$

2 $(2+i)^2 - (2-i)^2 = $ --------------------

(A) $4i$ (B) $8i$ (C) $6i$ (D) $10i$

3 Value of $\sin^2 \pi/4 + \cos^2 \pi/4 = $ --------------

(A) 0   (B) -1   (C) 1   (D) $\frac{1}{\sqrt{2}}$

4 $\sec(\pi/2 - \theta) = $ ------------

(A) $-\sec\theta$ (B) $-\csc\theta$ (C) $\sec\theta$ (D) $\csc\theta$

5 Period of $\csc x$ is --------------------

(A) 2π (B) π (C) 3π (D) $\pi/2$

6 Radius of escribed circle opposite to vertex A of triangle is ------------

(A) $\frac{\Delta}{S}$ (B) $\frac{\Delta}{S-a}$ (C) $\frac{\Delta}{S-b}$ (D) $\frac{\Delta}{S-c}$

7 $\cos x = \frac{1}{2}$, then $x = $ ------------

(A) $\pi/6$ (B) $\pi/4$ (C) $\pi/3$ (D) $\pi/2$

8 $\sin(\cos^{-1}\sqrt{3}/2) = $ ------------------------

(A) $\pi/6$ (B) $\pi/3$ (C) $\frac{2}{\sqrt{3}}$ (D) ½

9 1 is not ------------ number

(A) Odd   (B) Real   (C) Prime   (D) Rational

10 Multiplicative inverse of complex number (0,1)

(A) (0 , -1)   (B) (-1 , 0)   (C) (1 , 0)   (D) (0 , 1)

11 Set G is closed and associative with respect to binary operation, then set G is called

(A) Groupoid   (B) Semi-Group   (C) Monoid   (D) Group

12 Disjunction of two statements p and q is

(A) $p \wedge q$ (B) $p \vee q$ (C) $p \rightarrow q$ (D) $p \leftrightarrow q$

13 Tabular form of $\{x \mid x \in N \wedge x + 4 = 0\}$ is

(A) { }   (B) {0}   (C) {-4}   (D) {0,4}

14 A square matrix A is symmetric if $A^t = $

(A) A^t (B) $-A^t$ (C) A (D) $-A$

15 If order of matrix A is 2×5 and order of B is 5×7 , then order of AB is -------------

(A) 5×2 (B) 7×5 (C) 7×2 (D) 2×7

16 α, β are roots of $x^2 + 2x + 1 = 0$, then $\alpha^2 + \beta^2 = $ ------------

(A) 8   (B) 4   (C) -2   (D) 2

17 If ω is cube root of unity, then $(1 + \omega + \omega^2)^2 = $ ----------------

(A) ω (B) ω^2 (C) 0   (D) 1

18 $\frac{2}{x^2-1} = \frac{1}{x-1} + \frac{B}{x+1}$, then value of B is

(A) 1   (B) -1   (C) 2   (D) -2

19 Sum the series $1 + \frac{9}{10} + \frac{81}{100} + $ ------------

(A) 10   (B) 9   (C) 9/10   (D) $\frac{10}{9}$

20 5th term of sequence whose general term is $a_n = n + (-1)^n$ is

(A) 4   (B) -4   (C) 5   (D) -5

SECTION-I

DGK-1-24

QUESTION NO. 2 Write short answers any Eight (8) of the following   16

i	Simplify $(7, 9) + (3, -5)$
ii	Find the multiplicative inverse of $(-4, 7)$
iii	$\forall z \in C$, prove that $z.\bar{z} = \mid z \mid^2$
iv	Simplify i^{-10}
v	Write the power set of $\{9, 11\}$
vi	Construct the truth table for $(p \wedge \sim p) \rightarrow q$
vii	Find x and y if $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix}$
viii	If A and B are square matrices of the same order, then explain why in general $(A+B)^2 \neq A^2 + 2AB + B^2$
ix	Without expansion show that $\begin{vmatrix} 6 & 7 & 8 \\ 3 & 4 & 5 \\ 2 & 3 & 4 \end{vmatrix} = 0$
x	Solve the equation $x^2 - 2x - 899 = 0$ by completing the square
xi	Evaluate $\omega^{28} + \omega^{29} + 1$
xii	Find the condition that one root of equation $x^2 + px + q = 0$ is double the other.

QUESTION NO. 3 Write short answers any Eight (8) of the following   16

i	Define an identity
ii	Change $\dfrac{6x^3 + 5x^2 - 7}{2x^2 - x - 1}$ in to proper fraction
iii	Find the next two terms $1, 3, 7, 15, 31, \text{---------}$
iv	If $a_{n-3} = 2n - 5$, find the nth term of the sequence
v	Show that the reciprocals of the terms of the geometric sequence $a_1, a_1r^2, a_1r^4, \text{-----------}$ form another geometric sequence
vi	Find A.M between $x - 3$ and $x + 5$
vii	Find the value of n when ${}^nP_4 : {}^{n-1}P_3 = 9:1$
viii	Find the value of n when ${}^nC_{10} = \dfrac{12 \times 11}{2!}$
ix	Determine the probability of getting 2 heads and 2 tails when a coin is tossed four times
x	Prove $1 + 4 + 7 + \text{--------} + (3n - 2) = \dfrac{n(3n-1)}{2}$
xi	Calculate by means of Binomial theorem $(0.97)^3$
xii	Expand $(8 - 5x)^{-2/3}$ up to four terms.

(P.T.O)

i	If $\tan\theta = \dfrac{8}{15}$ and terminal arm of the angle is in the III quadrant, find the value of $\sin\theta$ and $\cos\theta$
ii	Prove that $\sec^2\theta - \csc^2\theta = \tan^2\theta - \cot^2\theta$
iii	If α, β, γ are angles of a triangle ABC, Prove that $\tan(\alpha+\beta) + \tan\gamma = 0$
iv	Find value of $\sec 75°$, without using tables
v	Prove that $\cos 20° + \cos 100° + \cos 140° = 0$
vi	Write the domain and range of $y = \tan x$
vii	Find the period of $\csc 10x$
viii	Draw the graph of $y = \sin\dfrac{x}{2}$ for $0 \le x \le 2\pi$
ix	Find the smallest angle of the triangle ABC, when $a = 37.34$, $b = 3.24$, $c = 35.06$
x	Find area of triangle ABC, if $a = 18$, $b = 24$, $c = 30$
xi	Prove that $r\, r_1 r_2 r_3 = \Delta^2$
xii	Without using calculator, show that $2\cos^{-1}\dfrac{4}{5} = \sin^{-1}\dfrac{24}{25}$
xiii	Find the solution of equation $\csc\theta = 2$ which lies in $[0, 2\pi]$

SECTION-II

Note: Attempt any Three questions from this section $10 \times 3 = 30$

Q.5- (A)	For what values of m, will the roots of the equation $x^2 - 2(1+3m)x + 7(3 + 2m) = 0$ be equal
(B)	Solve the system linear equations by Cramer's Rule $$2x_1 - x_2 + x_3 = 8$$ $$x_1 + 2x_2 + 2x_3 = 6$$ $$x_1 - 2x_2 - x_3 = 1$$
Q.6- (A)	Resolve into partial fractions $\dfrac{1}{(1-ax)(1-bx)(1-cx)}$
(B)	If $y = \dfrac{2}{3}x + \dfrac{4}{9}x^2 + \dfrac{8}{27}x^3 + \text{---------}$ and if $0 < x < \dfrac{3}{x}$, then show that $x = \dfrac{3y}{2(1+y)}$
Q.7-(A)	Prove that $^{n-1}C_r + {}^{n-1}C_{r-1} = {}^nC_r$
(B)	If x is so small that its square and higher powers can be neglected, show that $$\dfrac{1-x}{\sqrt{1+x}} \approx 1 - \dfrac{3}{2}x$$
Q.8-(A)	Show that $\cos 20° \cos 40° \cos 80° = \dfrac{1}{8}$
(B)	By using $\Delta = \dfrac{1}{2} bc \sin\alpha$ drive the Hero's formula
Q.9-(A)	If $\cot\theta = \dfrac{5}{2}$ and the terminal arm of the angle is in the I quad, find the value of $\dfrac{3\sin\theta + 4\cos\theta}{\cos\theta - \sin\theta}$
(B)	Prove that $2\tan^{-1}\dfrac{1}{3} + \tan^{-1}\dfrac{1}{7} = \dfrac{\pi}{4}$