K–5–Z

XIKDRO/N19
25505-Z
MATHEMATICS

[Maximum Marks : 100

Time : 3 Hours]

1 each

Section–A

1. Write the degree measure of $\dfrac{5\pi}{3}$.

2. If $\cos x = \dfrac{-3}{5}$, in which quadrant does x lie ?

3. If 'f' and 'g' are two real functions such that both $\lim\limits_{x \to a} f(x)$ and $\lim\limits_{x \to a} g(x)$ exist, then $\lim\limits_{x \to a} \big[f(x) + g(x) \big] = $ ....　　　(Fill in the blank)

4. The derivative of a constant function is ....　　　(Fill in the blank)

Section–B

2 each

5. If A = {3, 6, 9, 12, 15, 18} and B = {4, 8, 12, 16, 20}, then find (A − B) and (B − A).

6. Convert 40°-20' into radian measure.

7. Find the multiplicative inverse of $Z = 2 - 3i$.

8. Define a relation R on the set N of natural numbers by R = {(x, y) : y = x + 5}, x is a natural number < 4, x, y ∈ N}. Write down domain and range.

9. Evaluate :

$$\underset{x \to 0}{\text{Lt}} \frac{\sin ax}{\sin bx}$$

10. A box contains 1 red and 3 identical white balls. Two balls are drawn at random in succession without replacement. Write the sample space for it.

11. Find the coefficient of x^3 in the expansion of $(x + 3)^8$.

12. Find the first 5 terms of the sequence whose nth term is $a_n = \frac{2n - 3}{6}$.

Section-C   4 each

13. If X and Y are two sets such that $n(X) = 17$, $n(Y) = 23$ and $n(X \cup Y) = 38$, . find $n(X \cap Y)$.

14. Let $f(x) = x^2$ and $g(x) = 2x + 1$ be two real functions. Find $(f + g)_{(x)}$, $(f - g)_{(x)}$; $(f \cdot g)_{(x)}$ and $\left(\dfrac{f}{g}\right)_{(x)}$

15. Using principle of mathematical induction, prove that :

$$\frac{1}{1\cdot2}+\frac{1}{2\cdot3}+\frac{1}{3\cdot4}+\ldots\ldots+\frac{1}{n(n+1)}=\frac{n}{n+1}.$$

16. Prove that :

$$\tan 4x = \frac{4\tan x(1-\tan^2 x)}{1-6\tan^2 x + \tan^4 x}$$

17. Represent the complex number $Z = 1+\sqrt{3}\,i$ in the polar form and find its modulus and amplitude.

18. Find the derivative of $\dfrac{\sin(x+a)}{\cos x}$.

Or

Evaluate :

$$\underset{x\to 0}{\text{Lt}} \frac{\sqrt{1+x}-1}{x}$$

19. Find the equation of the circle which passes through origin (0, 0) and makes intercepts 'a' and 'b' on the co-ordinate axes.

20. In the expansion of $(1 + a)^{m+n}$, prove that coefficients of a^m and a^n are equal.

Or

Using Binomial theorem, prove that $(6^n - 5n)$ always leaves remainder 1 when divided by 25.

21. Three coins are tossed once. Find the probability of getting 3 heads, 2 heads, at least 2 heads.

Or

Given $P(A) = \dfrac{3}{5}$ and $P(B) = \dfrac{1}{5}$. Find P(A or B), if A and B are mutually exclusive events.

22. Find the co-ordinates of the point which divides the line segment joining the points $(-2, 3, 5)$ and $(1, -4, 6)$ in the ratio of (i) $2 : 3$ internally and (ii) $2 : 3$ externally.

23. (i) Write the negation of the statement "All triangles are not equilateral triangles."

    (ii) Write the converse of the statement "If two integers 'a' and 'b' are such that $a > b$, then $(a - b)$ is always positive integer."

Section–D

6 each

24. Prove that :

$$(\sin 3x + \sin x) \sin x + (\cos 3x - \cos x) \cos x = 0$$

Or

Find the general and principal solution of $\sin x + \sin 3x + \sin 5x = 0$.

25. How many words, with or without meaning, can be made from the letters of the word 'MONDAY', assuming that no letter is repeatable, if :

(i) 4 letters are used at a time

(ii) All letters are used at a time

(iii) All letters are used but first letter is vowel.

Or

In how many ways can a student choose a programme of 5 courses, if 9 courses are available and 2 specific courses are compulsory for every student.

26. If 'p' be the length of perpendicular drawn from the origin to the line whose intercepts on the axes are 'a' and 'b', then show that :

$$\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$$

27. Find the coordinates of foci, the vertices, the eccentricity and the length of latus rectum of the hyperbola :

$$\frac{x^2}{16} - \frac{y^2}{-9} = 1$$

28. The ratio of the sums of 'm' and 'n' terms of an A.P. is $m^2 : n^2$. Show that the ratio of their mth and nth terms is $(2m - 1) : (2n - 1)$.

Or

If A and G are the A.M. and G.M. respectively between two positive numbers, prove that the numbers are $A \pm \sqrt{(A + G)(A - G)}$.

29 Calculate mean, variance and standard deviation for the following frequency distribution :

Class	Frequency
0—10	5
10—20	8
20—30	15
30—40	16
40—50	6