15E(A)

MATHEMATICS Paper – I

MARCH 2008

Parts A and B

[Maximum Marks: 50 Time: 2½ Hours]

Instructions:

1. Answer the questions under **Part-A** on a separate answer book.
2. Write the answers to the questions under **Part-B** on the question paper itself and attach it to the answer book of **Part-A**.

PART – A

Time: 2 Hours **Marks: 35**

SECTION – I *(Marks: 5x2=10)*

Note:

1. Answer **ANY FIVE** questions, choosing **at least TWO** from each of the following two groups i.e., **A** and **B**.
2. Each question carries 2 marks.

GROUP – A

(Statements and Sets, Functions, Polynomials)

1. Define implication with truth table and give an example.
2. Show that $(\sim p) \vee (p \wedge q) \equiv (p \Longrightarrow q)$.
3. Define One-to-One function.
   Show that $f(x) = 3x - 2;\ x \in N$ is one-to-one.
4. State and prove Remainder Theorem.

GROUP – B

(Linear Programming, Real Numbers, Progressions)

5. Show the solutions of the following system of inequations through graphs.
   $x \geq 0; \quad y \geq 0; \quad x + y \leq 1.$

6. Solve $|3x - 5| = 10$.
7. Evaluate $\lim_{x \to 0} \frac{\sqrt{1+x+x2}-1}{x}$.
8. 2, 4, 6, 8 …….are in A.P. Find the sum of 100 terms and n terms.

SECTION – II *(Marks 4x1=4)*

Note:

1. Answer ANY FOUR of the following SIX questions.
2. Each question carries 1 mark.

9. Write the Inverse and Contrapositive of the following conditional statement – "If two triangles are congruent, then they are similar."
10. If $f(x) = \frac{x+1}{x-1}$, then show that $f(x) + f\left(\frac{1}{x}\right) = 0$.
11. Find the value of K so that $x^3 - 3x^2 + 4x + K$ is exactly divisible by $(x - 2)$.
12. At which of the points A(3, 0); B(0, 8), the function $f = x + 4y$ is minimum?
13. Find the product of $(x)^{\frac{1}{2}} . (x)^{\frac{3}{2}} . (x)^{\frac{4}{3}}$.
14. Which term of the A.P. 5, 2, -1 …… is -22?

SECTION – III *(Marks 4x4=16)*

Note:

1. Answer **ANY FOUR** questions, choosing **TWO** from each of the following groups i.e., **A and B**.
2. Each question carries 4 marks.

GROUP – A

(Statements and Sets, Functions, Polynomials)

15. Prove that for any three sets A, B, C;
    A – (B ∪ C) = (A – B) ∩ (A – C)
    (Use element-wise proof.)
16. If $f(x) = x + 2; g(x) = x^2 - x - 2; \quad (x \in R)$,
    Then find the value of $\frac{g(1)+g(2)+g(3)}{f(-4)+f(-2)+f(2)}$
17. Let f, g, h be functions defined by $f(x) = x$, $g(x) = 1 - x$ and $h(x) = x + 1$.
    Find (i) $(hog)of$ (ii) $ho(gof)$.
    From (i) and (ii) what do you conclude?
18. Using mathematical induction, prove that

$\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\ \ldots\ldots..+\frac{1}{n(n+1)}=\frac{n}{n+1}$.

GROUP – B

(Linear Programming, Real Numbers, Progressions)

19. A certain manufacturer has 75 kg. of cashew and 120 kg. of groundnuts. These are to be mixed in 1 kg. packages as follows: A low grade mixture 250 grams of cashew and 750 grams of groundnuts, whereas in a high grade mixture 500 grams of cashew and 500 grams of groundnuts. If the profit on the low grade mixture is Rs. 2 per package and that on high grade mixture is Rs. 3 per package, how many packages of each mixture be made for a maximum profit?
    (Write Objective function and System of Inequations without graph)
20. If $y=\sqrt[3]{3}+\frac{1}{\sqrt[3]{3}}$, then show that $3y^3-9y=10$.
21. If $(b+c),(c+a)$ and $(a+b)$ are in H.P., show that $\frac{1}{a^2},\frac{1}{b^2},\frac{1}{c^2}$ will also be in H.P.
22. If the sum of the first n natural numbers is S_1 and that of their squares is S_2 and cubes is S_3, then show that $9S_2^2=S_3(1+8S_1)$.

SECTION – IV *(Marks 1x5=5)*

(Linear Programming, Quadratics Equations and Inequations)

Note:

1. Answer **ANY ONE** question from the following.
2. It carries 5 marks.

23. Maximise $f=2x+y$, subject to the constraints
    i. $2x+5\leq 8$
    ii. $y\leq 4$
    iii. $x\leq 3$
    iv. $x\geq 0$
    v. $y\geq 0$
24. Using the graph of $y=x^2$, Solve the equation $x^2-4x+3=0$.

15E(B)

PART – B

Time: 30 minutes ***Marks: 15***

Note:

1. Each question carries ½ mark.
2. Answers are to be written in the question paper only.
3. All questions are to be answered.
4. Marks will not be given for over-written, re-written (or) erased answers.

I. Write the CAPITAL LETTERS of the correct answer in the brackets provided against each question.

1. $p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$ is
   (A) Commutative Law (B) Distributive Law (C) Identity Law (D) De Morgan's Law
2. If $A \subset B$ and $n(A) = 5; n(B) = 6$, then $n(A \cup B) = \cdots$
   (A) 6 (B) 5 (C) 11 (D) None
3. If $f(x) = x^2 - x + 6$, then $f(4) =$……
   (A) 0 (B) 18 (C) 6 (D) 2
4. $f(x) = x^2 + 4x - 12$, what are the zeroes of ?
   (A) {-6, 2} (B) {6, 2} (C) {3, 2} (D) {-3, -2}
5. The inequation for $1 < x < 3$ is …….
   (A) $x^2 + 4x + 3 < 0$ (B) $x^2 - 4x + 3 < 0$ (C) $x^2 - 4x - 3 < 0$ (D) $x^2 + 4x - 3 < 0$
6. The curve of the graph of $x = my^2$ $(m > 0)$ lies in the quadrants
   (A) 1 and 2 (B) 2 and 3 (C) 3 and 4 (D) 1 and 4
7. The point that lies in the half plane $x + y < 3$ is
   (A) (1, 1) (B) (2, 2) (C) (3, 3) (D) (4, 4)
8. $16^{0.5}$ = …….
   (A) 5.43 (B) 45 (C) 8 (D) 4
9. The 7th term of the series $1, -\frac{1}{2}, \frac{1}{4}$ ……is
   (A) $-\frac{1}{8}$ (B) $\frac{1}{16}$ (C) $-\frac{1}{32}$ (D) $\frac{1}{64}$
10. If a, b, c are in G.P., then
    (A) $a = bc$ (B) $b^2 = ac$ (C) $c = ab$ (D) $a^2 = bc$

II. Fill in the blanks with suitable answers.

11. The truth value of implication statement:
    If 3+2 = 5, then 1X0 = 0 is ……
12. The set builder form of B = {1, 8, 27, 64, 125} is ……
13. $f(x) = x^3$; $g(x) = x^2 - 2$ for $x \in R$; then $gof(x)$ ……
14. The 5th term in the expansion of $(3x + 4)^6$ is ……..
15. If the sum of co-efficients of polynomial $f(x)$ is zero, then …… is factor to it.
16. Any point (x, y) in the feasible region gives a solution to LPP is called …….
17. $64^x = 2\sqrt{2}$, then x = ……..
18. The limiting position of secant of a Circle is ……
19. If $x + y, x - y, x - 3y$, ……. are in A.P., then the 15th term is …….
20. Sum of n terms of the progression 1, 4, 9, 16 ……. is ……..

III. For the following questions under Group-A, choose the correct answer from the master list Group-B and write the letter of the correct answer in the brackets provided against them.

(i)

Group – A		Group – B
21. If $A \subset B$, then $A \cap B =$ ……	[……]	(A) -15
22. Product of roots of equation $x^2 - 3x - 15 = 0$	[……]	(B) Identity Function
23. If $f(x) = x$, then f is ……	[……]	(C) A
24. Solutions of $x < 0; y < 0$ lie in …..	[……]	(D) $x \geq a\ (or)\ x \leq -a$
25. $\|x\| \geq a$	[……]	(E) $-a \leq x \leq a$
		(F) B
		(G) III
		(H) IV

(ii)

Group – A		Group – B
26. If $\sqrt{x^a} = x^{\frac{2}{3}}$, then $a =$ …..	[……]	(I) 1
27. $a^x = b, b^y = c, c^z = a$, then the value of $xyz =$ ……	[……]	(J) $\frac{2}{3}$
28. In a G.P.; a = 2, S_ = 6, then r = ……..	[……]	(K) $G^2 = AH$
29. Relation between A.M., G.M., H.M.	[……]	(L) $x + 2$
30. If $f(x) = x + 2, g(x) = x$, then $fog(x) =$	[……]	(M) $\frac{4}{3}$
		(N) x
		(O) $A^2 = GH$
		(P) $\frac{4}{9}$

********** END **********