SETHU BHASKARA MATRIC. HR. SEC. SCHOOL, PUDUR

Std: XI — Maths - Answer Key — QUARTERLY EXAM-2022

I. Choose the correct answer

SECTION-A

20×1 = 20

1. b) 4
2. c) 512
3. c) $[0,1)$
4. c) n
5. d) $[0,9]$
6. b) cnto
7. c) 6
8. b) $[2,\infty)$
9. c) -4
10. b) 7
11. c) 2
12. c) 9,1
13. c) 3
14. b) $[-11,7]$
15. d) 4
16. a) 0
17. d) $\sec\theta = 1/4$
18. a) 10π seconds
19. d) $2\cos x$
20. c) $-a/b$

SECTION-B

II. 21) Let $A = \{-1, 1\}$

$A = \{x \in R : x^2 = 1\}$ — 1½

22) $f(-4) = 8$ — 1

$f(1) = 0$ — 1

23) B is $[-16, 16]$ — 2

24) $x^2 - x(7-3) + (7)(-3) = 0$ — 1

$x^2 - 4x - 21 = 0$ — 1

25) $-7 < 3 - x < 7$

$-7-3 < -x < 7-3$ — 1

$-10 < -x < 4$

$-4 < x < 10$ — 1

26) $x^4 - 16 = 0$

$(x^2+4)(x^2-4) = 0$ — 1

$x^2 + 4 \neq 0$ is not real; $x^2 - 4 = 0$

$x = \pm 2$ — 1

Real roots are -2 & 2

27) $(125)^{2/3} = (5^3)^{2/3} = 5^2 = 25$ — 1, 1

28) i) $\sin 150^\circ = \sin(180-30) = \sin 30^\circ = 1/2$ — 1

ii) $\cos 135^\circ = \cos(90+45) = -\sin 45^\circ = -\frac{1}{\sqrt{2}}$ — 1

29) i) $\sin 40^\circ \cos 30^\circ = \frac{1}{2}[\sin(40+30) + \sin(40-30)] = \frac{1}{2}[\sin 70 + \sin 10]$ — 1

ii) $\cos 110^\circ \sin 55^\circ = \frac{1}{2}[\sin(55+110) + \sin(55-110)] = \frac{1}{2}[\sin 165 - \sin 55]$ — 1

$[\sin A \cos B = \frac{1}{2}[\sin(A+B) + \sin(A-B)]]$

30) $\cot\theta = \sqrt{3} \Rightarrow \tan\theta = 1/\sqrt{3}$ $\theta = \pi/6$ is the principal solution — 1

General solution $\theta = n\pi + \pi/6$; $n \in Z$ — 1

SECTION – C

III · 31) $n(P(A)) = 1024$ $n(A \cup B) = 15$ $n(P(B)) = 32$ — 1

$n(A) = 10$ $n(B) = 5$ $n(A \cap B) = n(A) + n(B) - n(A \cup B)$ — 1

$= 10 + 5 - 15 = 0$ — 1

32) $A = \{a, b, c\}$ i) $R = \{(a,a)(b,b)(c,c)\}$ ii) $n(R) = 9$ — 1

$n(R) = 3$ — 1

$\therefore$ Smallest set $= \{(a,a)(b,b)(c,c)\}$ Largest set $= A \times A$ — 1

33) Domain $= R - \{2n\pi \pm \pi/3\}$; $n \in Z$ — 1

$1 - 2\cos x = 0$ — 1

$2\cos x = 1$

$\cos x = 1/2 = \cos \pi/3$

$x = 2n\pi \pm \pi/3$ — 1

34) $2x^2 + x - 15 \leq 0$

$(x+3)(x-5/2) \leq 0$ — 1

+ve | −ve | +ve

$-\infty$ $\quad -3 \quad$ $5/2$ $\quad \infty$ — 1

$x \in [-3, 5/2]$ — 1

35) $\frac{1}{x^2 - a^2} = \frac{A}{x+a} + \frac{B}{x-a}$ $B = 1/2a$ $A = -1/2a$ — 2

$\frac{1}{x^2 - a^2} = \frac{-1/2a}{x+a} + \frac{1/2a}{x-a} = \frac{1}{2a(x-a)} - \frac{1}{2a(x+a)}$ — 1

36) $\log_{5-x}(x^2 - 6x + 65) = 2$

$(5-x)^2 = x^2 - 6x + 65$ — 1

$25 - 10x + x^2 = x^2 - 6x + 65$ — 1

$4x + 40 = 0 \Rightarrow 4x = -40 \quad x = -10$ — 1

37) $\tan 75^\circ = \tan(45^\circ + 30^\circ)$

$= \frac{\tan 45 + \tan 30}{1 - \tan 45 \tan 30} = \frac{1 + 1/\sqrt{3}}{1 - 1/\sqrt{3}} = \frac{\sqrt{3}+1}{\sqrt{3}-1}$ $\cot 75^\circ = \frac{\sqrt{3}-1}{\sqrt{3}+1}$ — 1

$\tan 75^\circ + \cot 75^\circ = \frac{\sqrt{3}+1}{\sqrt{3}-1} + \frac{\sqrt{3}-1}{\sqrt{3}+1} = \frac{(\sqrt{3}+1)^2 + (\sqrt{3}-1)^2}{(\sqrt{3})^2 - 1} = 8/2 = 4$ — 2

38) $\cos\theta = \frac{1}{2}(a + 1/a)$ $\cos 3\theta = 4\cos^3\theta - 3\cos\theta$

$\cos 3\theta = 4\left(\frac{1}{2}(a + 1/a)\right)^3 - 3\left[\frac{1}{2}(a + 1/a)\right]$ — 1

$= 4\left(\frac{1}{8}(a^3 + 3a^2)\left(\frac{1}{a}\right) + 3a(1/a^2) + 1/a^3 - 3/2\,(a + 1/a)\right]$ — 1

$= \frac{1}{2}(a^3 + 1/a^3)$ — 1

Interval	$\frac{x^3(x-1)}{x(x-2}$
$(-\infty,0)$	−
$(0,1)$	+
$(1,2)$	−
$(2,\infty)$	+

Solution set $x \in (0,1) \cup (2,\infty)$ 2

44)a) $\frac{3x+1}{(x-2)(x+1)} = \frac{A}{x-2} + \frac{B}{x+1}$ 1

$\frac{3x+1}{(x-2)(x+1)} = \frac{A(x+1)+B(x-2)}{(x-2)(x+1)}$

$3x+1 = A(x+1)+B(x-2)$ 1

$B = 2/3 \quad A = 7/3$ 2

$\frac{3x+1}{(x-2)(x+1)} = \frac{7/3}{x-2} + \frac{2/3}{x+1}$ 1

b) 44) $\frac{\log x}{y-z} = \frac{\log y}{z-x} = \frac{\log z}{x-y} = k$ 1

$\log x = k(y-z) \quad \log y = k(z-x)$

$\log z = k(x-y)$ 1

$\log x + \log y + \log z = ky - kz + kz - kx + kx - ky$ 1

$\log xyz = 0$ 1

$xyz = e^0 = 1$ 1

45)a) $k(x-1)^2 = 5x-7$

$kx^2 - 2kx + k = 5x - 7$

$kx^2 - x(2k+5) + (k+7) = 0$ 1

Let the roots be α & 2α

$\therefore \alpha + 2\alpha = \frac{2k+5}{k} \Rightarrow 3\alpha = \frac{2k+5}{k}$ 1

(or) $\alpha = \frac{2k+5}{3k}$

$\alpha \cdot 2\alpha = \frac{k+7}{k}$ (3) $\alpha = \frac{2k+5}{3k}$

$2\left(\frac{2k+5}{3k}\right)^2 = \frac{k+7}{k}$ 1

$8k^2 + 40k + 50 = 9k^2 + 63k$

$k^2 + 23k - 50 = 0$ 1

$(k-2)(k+25) = 0$

$k = 2$ (or) $k = -25$ 1

b) 45) Let x & $x+2$ be consecutive odd natural numbers. 1

$x > 10$

$x + x + 2 < 40$

$2x + 2 < 40$ 1

$x < 19$

The numbers 11, 13, 15, 17 1

∴ The required pairs of odd natural numbers are

(11,13) (13,15) (15,17) (17,19) 2

46)a) $A + B = 45$

$\tan(A+B) = \tan 45$ 1

$\frac{\tan A + \tan B}{1 - \tan A \tan B} = 1$ 1

$\tan A + \tan B = 1 - \tan A \tan B$

$\tan A + \tan B + \tan A \tan B = 1$ 1

Add ① on both sides. 1

$1 + \tan A + \tan B + \tan A \tan B = 2$

$1(1+\tan A) + (\tan B)(1+\tan A) = 2$

$(1+\tan A)(1+\tan B) = 2$ 1

39) $s = \frac{a+b+c}{2} \Rightarrow \frac{13+14+15}{2} = 21$ cms 1

Area of a triangle $= \sqrt{s(s-a)(s-b)(s-c)}$ 1

$= \sqrt{21(21-13)(21-14)(21-15)} = 84$ sq. 1

40) $\log\left(\frac{a^2}{bc}\right) + \log\frac{b^2}{ca} + \log\frac{c^2}{ab}$ ½

$= \log\left(\frac{a^2}{bc} \times \frac{b^2}{ca} \times \frac{c^2}{ab}\right) = \log 1$ 2

$= 0$ R.H.S ½

SECTION – D

III. 41) a) $A \times (B \cap C) = (A \times B) \cap (A \times C)$

$A = \{1, 2\}$ $B = \{2\}$ $C = \{2, 3\}$. 1

$B \cap C = \{2\}$

$A \times (B \cap C) = \{(1,2)(2,2)\}$ — ① 2

$A \times B = \{(1,2)(2,2)\}$

$A \times C = \{(1,2)(1,3)(2,2)(2,3)\}$

$(A \times B) \cap A \times C = \{(1,2)(2,2)\}$ — ② 2

From ① & ②

$A \times (B \cap C) = (A \times B) \cap (A \times C)$

41) b) $A \times A$ contains 16 elements

$n(A) = 4$ 1

The elts of $A \times A$ are $(1,3)$ & $(0,2)$ 1

The possible elements of A are

$A = \{0, 1, 2, 3\}$ 3

42) a) mRm

$m - m = 0$ & $0 = 0 \times 12$

$mRm \Rightarrow R$ is reflexive 1

$mRn \Rightarrow m - n = 12k$ 2

$n - m = 12(-k)$

and hence $nRm \Rightarrow R$ is symmetric

Let mRn & nRp; $m - n = 12k$ 2

$n - p = 12l$

So $m - p = 12(k+l) \Rightarrow mRp$

$\Rightarrow R$ is transitive

Thus R is an equivalence relation

12) b) $y = 3x - 5 \Rightarrow x = \frac{y+5}{3}$ 1

Let $g(y) = \frac{y+5}{3}$

$*gof(x) = g(f(x)) = g(3x-5)$

$= \frac{3x-5+5}{3} = x$ 1½

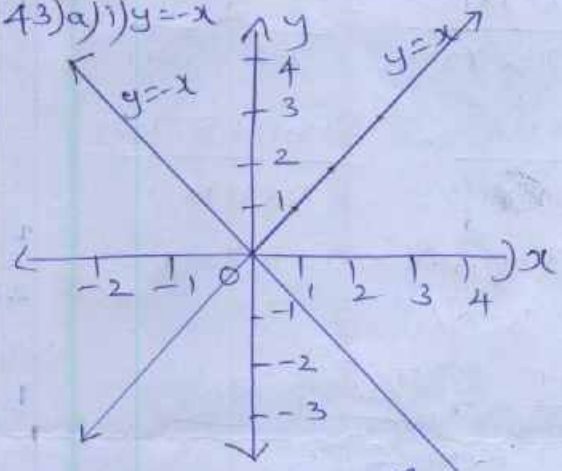
$*fog(y) = f(g(y)) = f\left(\frac{y+5}{3}\right) = y$ 1½

$\therefore f$ and g are bijections and inverses to each other.

$f^{-1}(x) = \frac{x+5}{3}$ 2

Also Any other method

43) a) i) $y = -x$



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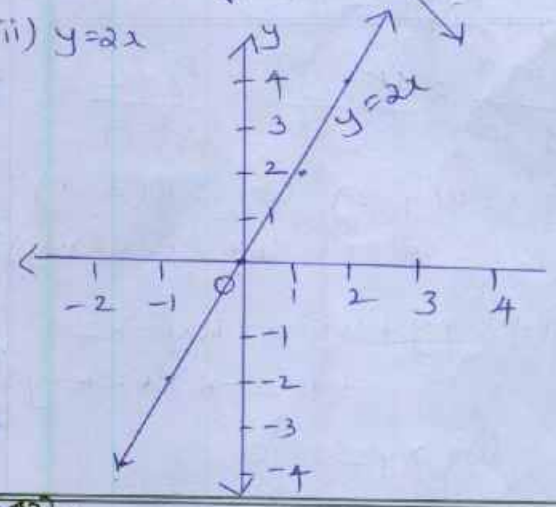
ii) $y = 2x$



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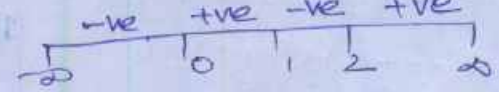
13) b) $\frac{x^3(x-1)}{x-2} > 0$

The critical nos are 0, 1 & 2 1



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The possible intervals are

$(-\infty, 0)(0, 1)(1, 2)(2, \infty)$

46) b) $A+B+C=180$

L.H.S

$\sin 2A + \sin 2B + \sin 2C$

$= 2\sin(A+B)\cos(A-B) + 2\sin C\cos C$ — 1

$= 2\sin(180-C)\cos(A-B) + 2\sin C\cos C$ — 1

$= 2\sin C\cos(A-B) + 2\sin C\cos(180-(A+B))$ — 1

$= 2\sin C[\cos(A-B) - \cos(A+B)]$ — 1

$= 2\sin C[2\sin A\sin B]$

$= 4\sin A\sin B\sin C$ (R.H.S.) — 1

47) a) $\sin\theta + \sin 3\theta + \sin 5\theta = 0$

$2\sin 3\theta\cdot\cos 2\theta + \sin 3\theta = 0$ — 1

$\sin 3\theta(2\cos 2\theta + 1) = 0$

$\sin 3\theta = 0$ — 1

$3\theta = (-1)^n\cdot 0 + n\pi$

$3\theta = n\pi$

$\theta = \frac{n\pi}{3}$; $n \in Z$ — 1

$\cos 2\theta = -\frac{1}{2}$ — 1

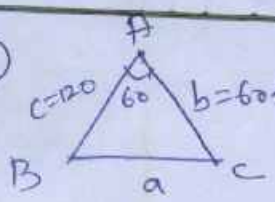
$2\theta = 2\pi/3$

$\cos 2\theta = \cos 2\pi/3$

$2\theta = 2n\pi \pm 2\pi/3$ — 1

$\theta = n\pi \pm \pi/3$; $n \in Z$ — 1

47) b)



$\frac{1}{2}$

$\Delta = \frac{1}{2}bc\sin A$

$= \frac{1}{2}\times 120\times 60\times \sin 60^\circ$ — 1½

$= 1800\sqrt{3}$ sq.ft.

Cost $= 1800\sqrt{3}\times 500 =$ Rs 15,58,800 — 1

$a^2 = 120^2 + 60^2 - 2(120)(60)\cos 60^\circ$

$= 14400 + 3600 - 7200$

$a^2 = 10800$ — 1

$a = \sqrt{100\times 9\times 4\times 3}$ $\quad a = 60\sqrt{3}$

Perimeter $= 120 + 60 + 60\sqrt{3}$

$= 180 + 60\sqrt{3}$ ft. — 1

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HANDLING TEACHERS NAME & Signature

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