# ANSWER KEY

FIRST YEAR HIGHER SECONDARY EXAMINATION March 2023

**PART-~~II~~/III**

**SUBJECT:** Mathematics Science (HI)

**CODE NO:** ~~FY65~~ 465 **VERSION:** F

60 **SCORES** 2 **HOURS**

| Qn. No | Sub Qns | Answer Key/Value Points | Score | Total Score |
|---|---|---|---|---|
| 1. | (a) | (i) $A-B = \{3,5\}$ | 1 | |
| | | (ii) $A \cap B = \{7,9,11\}$ | 1 | |
| | (b) | (ii) $(-4,6]$ | 1 | 3 |
| 2. | (a) | (iv) 6 | 1 | |
| | (b) | Domain $= \{1,2,3,4\}$ | 1 | |
| | | Range $= \{2,3,4,5\}$ | 1 | 3 |
| 3. | | | | |
| | (a) | $\sin(-x) = -\sin x$ (iv) | 1 | |
| | (b) | $\cos(\pi/2 - x) = \sin x$ (iii) | 1 | |
| | (c) | $\tan \pi/4 = 1$ (ii) | 1 | 3 |
| 4. | | $6x - 4x < 7 - 3$ | 1 | |
| | | $2x < 4$ | 1 | |
| | | $x < 2$ | 1 | 3 |
| 5. | (a) | (ii) 1 | 1 | |
| | (b) | $\frac{8!}{6! \times 2!} = \frac{6! \times 7 \times 8}{6! \times 2!} = 28$ | 2 | 3 |
| 6. | (a) | (ii) (3,0,5) | 1 | |
| | (b) | distance $= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2}$ | 1 | |
| | | $= \sqrt{9+9+9} = 3\sqrt{3}$ | 1 | 3 |

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| 7. | (a) | (iv) $na^{n-1}$ | 1 | |
| | (b) | $\lim_{x\to 1} \frac{x^{15}-1}{x^{10}-1} = \lim_{x\to 1} \frac{x^{15}-1}{x-1} \div \lim_{x\to 1} \frac{x^{10}-1}{x-1}$<br>$= 15 \div 10 = 3/2$ | 2 | 3 |
| 8. | (a) | $P(A') = 1 - P(A)$<br>$= 1 - 0.42 = 0.58$ | 1 | |
| | (b) | $P(A \cup B) = P(A) + P(B) - P(A \cap B)$<br>$= 0.42 + 0.48 - 0.16$<br>$= 0.74$ | 1<br>1 | 3 |
| 9. | (a) | $(f+g)(x) = f(x) + g(x)$<br>$= x^2 + 2x$ | 1 | |
| | (b) | $(fg)(x) = f(x) \cdot g(x)$<br>$= x^2 \cdot 2x = 2x^3$ | 2 | |
| | (c) | $f(0) = 0^2 = 0$ | 1 | 4 |
| 10. | (a) | $\sin(x+y) = \sin x \cos y + \cos x \cdot \sin y$ | 1 | |
| | (b) | $\sin 75 = \sin(45+30)$<br>$= \sin 45 \cos 30 + \cos 45 \sin 30$<br>$= \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \cdot \frac{1}{2}$<br>$= (\sqrt{3}+1)/2\sqrt{2}$ | 1<br>2 | 4 |
| 11. | (a) | (ii) 1 | 1 | |
| | (b) | $n = 9 + 8 = 17$<br>$^{n}C_{17} = {}^{17}C_{17} = 1$ | 1<br>1+1 | 4 |
| 12. | (a) | 5 | 1 | |
| | (b) | $(2+x)^4 = 2^4 + {}^4C_1 \cdot 2^3 \cdot x + {}^4C_2 \cdot 2^2 \cdot x^2 + {}^4C_3 \cdot 2 \cdot x^3 + {}^4C_4 \cdot x^4$ | 2 | |

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|---|---|---|---|---|
| | | $= 16 + 32x + 24x^2 + 8x^3 + x^4$ | 1 | 4 |
| 13. | (a) | $a = 5, \; r = 5$ | 1 | |
| | | $a_n = a \times r^{n-1}$ | 1 | |
| | | $= 5 \times 5^{n-1} = 5^n$ | | |
| | (b) | $S_{10} = \frac{a(r^n - 1)}{r - 1}$ | 1 | |
| | | $= \frac{5(5^n - 1)}{5 - 1} = \frac{5}{4}(5^n - 1)$ | 1 | 4 |
| 14. | (a) | $(x_1, y_1) = (1, 8), \; m = -4$ | 1 | |
| | | $y - y_1 = m(x - x_1)$ | 1 | |
| | | i.e., $y - 8 = -4(x - 1)$ | | |
| | | $4x + y = 12$ | | |
| | (b) | $a = 3 \qquad b = 2$ | 1 | |
| | | $\frac{x}{a} + \frac{y}{b} = 1$ | 1 | 4 |
| | | i.e., $\frac{x}{3} + \frac{y}{2} = 1$ | | |
| 15. | | $a = 5, \; b = 3$ | | |
| | | Vertices $(\pm a, 0) = (\pm 5, 0)$ | 1 | |
| | | length of major axis $= 2a = 10$ | 1 | |
| | | length of minor axis $= 2b = 6$ | 1 | |
| | | latus rectum $= \frac{2b^2}{a} = \frac{2 \times 9}{5} = \frac{18}{5}$ | 1 | 4 |
| 16. | (a) | $3x^2$ | 1 | |
| | (b) | $\frac{d}{dx}(\sin x \cdot \cos x) = \sin x \frac{d}{dx}\cos x + \cos x \cdot \frac{d}{dx}\sin x$ | 1 | |
| | | $= \sin x \cdot -\sin x + \cos x \cdot \cos x$ | 2 | 4 |
| | | $= \cos^2 x - \sin^2 x$ | | |

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| 17. | (a) | $\phi$, {1}, {2}, {1,2} | 2 | |
| | (b) | $A \cap B = \{2\}$ | 1 | |
| | | $(A \cap B)' = \{1,3,4,5,6,7,8\}$ — ① | 1 | |
| | | $A' = \{1,3,5,7\}$ $B' = \{1,4,6,8\}$ | 1 | |
| | | $A' \cup B' = \{1,3,4,5,6,7,8\}$ — ② | 1 | 6 |
| | | From ① and ② $(A \cap B)' = A' \cup B'$ | | |
| 18. | (a) | (i) $z_1 + z_2 = 6 + 10i$ | 1 | |
| | | (ii) $z_1 \times z_2 = 8 + 14i + 12i + 21i^2$ | 1 | |
| | | $= 8 + 26i - 21$ | 1 | |
| | | $= -13 + 26i$ | | |
| | (b) | $i^9 + i^{19} = (i^2)^4 \cdot i + (i^2)^9 \cdot i$ | 2 | |
| | | $= i + -1 \times i$ | 1 | 6 |
| | | $= 0 \quad = 0 + i \cdot 0$ | | |
| 19. | (a) | distance $= \left\| \frac{ax_1 + by_1 + c}{\sqrt{a^2+b^2}} \right\|$ | 1 | |
| | | $= \left\| \frac{5+3}{\sqrt{12^2+5^2}} \right\|$ $(x_1, y_1) = (0,1)$ | 2 | |
| | | $= \frac{8}{13}$ | | |
| | (b) | distance $= \left\| \frac{c_1 - c_2}{\sqrt{a^2+b^2}} \right\|$ | 1 | |
| | | $c_1 = 7$ $c_2 = 9$ | | |
| | | $= \left\| \frac{7-9}{\sqrt{4^2+3^2}} \right\|$ | 2 | 6 |
| | | $= \frac{2}{5}$ | | |

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| 20. | | | | |

| $x_i$ | $f_i$ | $f_i x_i$ | $f_i x_i^2$ |
|---|---|---|---|
| 3 | 8 | 24 | 72 |
| 8 | 11 | 88 | 704 |
| 13 | 15 | 195 | 2535 |
| 18 | 10 | 180 | 3240 |
| 23 | 6 | 138 | 3174 |
| | 50 | 625 | 9725 |

2

Mean, $\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i}$ 1

$= \frac{625}{50} = 12.5$

Variance, $\sigma^2 = \frac{\Sigma f_i x_i^2}{\Sigma f_i} - (\bar{x})^2$ 2

$= \frac{9725}{50} - (12.5)^2$

$= 194.5 - 156.25$

$= 38.25$ 1 6

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