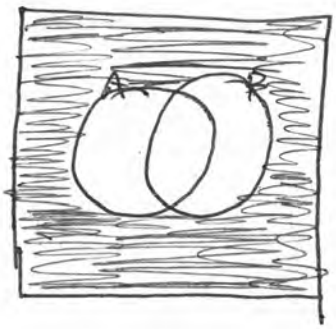
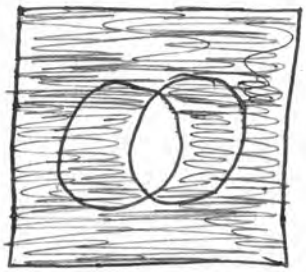
Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
1	(a)	$n = 6$	1	
	(b)	$A = \{M, A, T, H, E, I, C, S\}$		
		$B = \{S, T, A, I, C\}$		
		(i) $A - B = \{M, H, E\}$	1	3
		(ii) $A \cap B = \{T, I, C, S\}$	1	
		Remark : (a) 2^1 give (1) score		
		(b) Correct A & B (2) score.		
2	(a)	(i) $80^\circ, 40^\circ, 60^\circ$	1	
		(ii) $\frac{4\pi}{9}^c, \frac{2\pi}{9}^c, \frac{\pi}{3}^c$	1	3
	(b)	$-\tan x$	1	
		Remark: (a) (i) Analyse give (1) score.		
		(ii) Analyse give (1) score.		
		(b) Analysing the question give (1) score.		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
3	a)	$x^2 - x + 1 = 0$		
		$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$	$\frac{1}{2}$	
		$= \frac{1 \pm \sqrt{1-4}}{2}$		
		$= \frac{1 \pm \sqrt{3}i}{2}$	$\frac{1}{2}$	
	b)	Polar form of $z = r[\cos\theta + i\sin\theta]$	1	3
		$r = \lvert z \rvert = 1$	1	
		Arg $(z) = \pi/3$		
		polar form of $z = 1[\cos\pi/3 \pm i\sin\pi/3]$		
		Remark Using (a) polar form of (b) is correct give 2		
4		Average mark $= \frac{87+92+94+95+x}{5}$	1½	
		$\frac{368+x}{5} \geq 90$	1	3
		$x \geq 82$	½	
		Remark. The inequality is $\leq, =$ give (2)		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
5.	(a)	10	1	3
	(b)	$(\pm 3, 0)$	1	
	(c)	$LR = \frac{2b^2}{a} = \frac{32}{5}$	1	
		Remark: (a) Analyse give (1) score. (b) For correct a and b give (1/2) score. For $(\pm c, 0)$ (1/2) score (c) Analyse give (1) score.		
6	(a)	$n = 5$	1	3
	(b)	0	1	
	(c)	10	1	
		Remark (a) for formula na^{n-1} (1/2) score (b) $\sin^2 x + \cos^2 x = 1$ (1) score (or) $\frac{d}{dx}(\sin^2 x) + \frac{d}{dx}(\cos^2 x)$ (1) score (c) 27 - give one score.		
7	(a)	$5C_2 \times 3C_2 = 30$	1	3
	(b)	${}^nP_r = 720$, ${}^nC_r = 120$ (1/2 + 1/2)	2	
		${}^nP_r = r!\,{}^nC_r$ (1/2) $720 = r!(120)$, $r = 3$ (1/2)		
		Remark (a) Analyse give (1) score (b) formula for ${}^nC_r$, ${}^nP_r$ (1) score		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
8	a)	$n(U) = 600$ $n(T) = 150$ $n(C) = 225$ $n(T \cap C) = 100$	1	4
		$n(T \cup C) = n(T) + n(C) - n(T \cap C)$ $= 150 + 225 - 100 = 275$	$\frac{1}{2}$	
		n(Neither Tea Nor Coffee) $= 600 - 275$ $= 325$	$\frac{1}{2}$	
	b)	$(A \cup B)'$  $(A' \cup B')$ 	1+1	

Remarks

a) Formulae of union give (1)
Using Venn diagram and Find (a) give (2)

(b) Incorrect shading reduce $\frac{1}{2}$ only (give $1\frac{1}{2}$)

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
9	(a)	$(a+ib)(c+id)(e+if) = A+iB$ $(a-ib)(c-id)(e-if) = A-iB$ $(a^2+b^2)(c^2+d^2)(e^2+f^2) = A^2+B^2$	2	
	(b)	$z = 1+i$ $x+iy = \sqrt{1+i}$ (1/2) Squaring $x^2-y^2+i2xy = 1+i$ (1/2) $x^2-y^2 = 1$ — ① $2xy = 1$ — ② } (1/2) $(x^2+y^2)^2 = (x^2-y^2)^2 + 4x^2y^2$ $= 1+1 = 2$ (1/2) $x^2+y^2 = \sqrt{2}$ — ③ ① + ③ $\Rightarrow 2x^2 = 1+\sqrt{2}$ $x = \pm\sqrt{\frac{1+\sqrt{2}}{2}}$ ② − ① $\Rightarrow 2y^2 = \sqrt{2}-1$ $y = \pm\sqrt{\frac{\sqrt{2}-1}{2}}$ $\sqrt{1+i} = \pm\left[\sqrt{\frac{\sqrt{2}+1}{2}} + i\sqrt{\frac{\sqrt{2}-1}{2}}\right]$ Remark : (a) Analyse give ② score. (b) Any alternate method give full score.	2	4

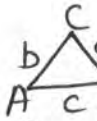
Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
10	a)	$P(1) = a$	1	
	b)	$P(k) = a + ar + ar^2 + \cdots + ar^{k-1}$ $= a[r^k - 1]/r - 1$	1	
	c)	$P(k+1)$: $a + ar + ar^2 + \cdots + ar^{k-1} + ar^k$	1	
		$= \frac{a[r^k - 1]}{r-1} + ar^k$	$\frac{1}{2}$	4
		$= \frac{ar^k - a + ar^{k+1} - ar^k}{r-1}$		
		$= \frac{ar^{k+1} - a}{r-1}$		
		$= \frac{a[r^{k+1} - 1]}{r-1}$	$\frac{1}{2}$	
11)		Given graph is incorrect give full score.	4	4
12	a)	Slope $= \frac{y_2 - y_1}{x_2 - x_1}$	$\frac{1}{2}$	
		$= -\frac{1}{5}$	$\frac{1}{2}$	
	b)	Slope of $\perp^r$ line $= 5$	$\frac{1}{2}$	
		Equation $y - y_1 = m(x - x_1)$	1	4
		$5x - y + 20$	$\frac{1}{2}$	
	c)	Any answer give (1)	1	
		Remark (b) $m_1 \times m_2 = -1$ give $\frac{1}{2}$		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
13	(a)	$\frac{3}{4}$	1	
	(b)	$\frac{-4}{3}$	1	
	(c)	$y-3 = \frac{-4}{3}(x+1)$ $3y-9 = -4x-4$ $4x+3y-5=0$ — ①	1	4
	(d)	$3x-4y-16=0$ — ② Solving ① & ② $x=\frac{68}{25}$, $y=\frac{-49}{25}$ Remark: (a) slope $=\frac{-b}{a}$ (1/2) score. (b) $m_1m_2=-1$ (1/2) score (c) Analyse (1) score. (d) Analyse (1) score.	1	
14	(a)	Centre $=(2,-3)$ (1/2) Radius $=5$ (1/2)	1	
	(b)	Centre $=(2,-3)$ (1/2) Radius $2\times5=10$ (1/2) Equation is $(x-2)^2+(y+3)^2=100$ (1)	2	
	(c)	$(a,0) = (1,0)$ Remark: (b) formula of circle $(x-h)^2+(y-k)^2=r^2$ give (1/2) score. (c) $(a,0)$ (or) $(4,0)$ give (1) score	1	4

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
15	a)	Centroid $= \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}, \frac{z_1+z_2+z_3}{3}\right)$	1	
		$a = -2$ $b = \frac{-16}{3}$ $c = 2$	1	
	b)	$PQ = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2}$	$\frac{1}{2}$	
		$= \sqrt{580}$	$\frac{1}{2}$	4
	c)	In yz plane $x = 0$	$\frac{1}{2}$	
		$m : n = 2 : 3$	$\frac{1}{2}$	
		Remarks a) Any two of a, b and c is correct give (2) b) Using (a), b is correct give 1		
16	a)	$3C_2$	$\frac{1}{2}$	
		$5C_4$	$\frac{1}{2}$	
		$3C_2 \times 5C_4$	$\frac{1}{2}$	
		$3C_2 \times 5C_4 \times 6!$	$\frac{1}{2}$	4
	b)	$(n-1)P_3 : nP_4 = 1 : 9$		
		$\frac{(n-1)P_3}{nP_4} = \frac{1}{9}$	$\frac{1}{2}$	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
		$\frac{(n-1)(n-2)(n-3)}{n(n-1)(n-2)(n-3)} = \frac{1}{9}$	1	
		$n = 9$	$\frac{1}{2}$	
		Remarks		
		$nP_r = \frac{n!}{(n-r)!}$ 1		
17	a)	If $x^2 \neq 4$, then $x \neq 2$	1	
	b)	Suppose x is not even (odd)	1	
		$\therefore x = 2n+1$	1	4
		$x^2 = (2n+1)^2$		
		$= 4n^2 + 4n + 1$	$\frac{1}{2}$	
		$\Rightarrow x^2$ is odd	$\frac{1}{2}$	
		Remark.		
		b) Contrapositive is correct give 1		
		OR		
		* Concept of cotrapositive give 1		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
18	(a)	$f(100) = 1$	1	
	(b)	Give full score	2	
	(c)	(i) $y = 2 - 3x$ (1) $x = \frac{2-y}{3} > 0$ $2 - y > 0 \Rightarrow 2 > y \therefore y < 2$ (1) Range $= (-\infty, 2)$	2	6
		(ii) $\frac{g(x)}{h(x)} = \frac{2-3x}{x^2-3x+2} = \frac{2-3x}{(x-1)(x-2)}$ (1/2+1/2) Domain $= R^+ - \{1, 2\}$	1	
		Remark: (a) Definition or graph of signum fn (1) score. (c) $h(x) = 0$ (or) $(x-1)(x-2) = 0$ give (1/2) score. $R - \{1, 2\}$ (1) score.		
19	(a)	$\sin^2 8x - \sin^2 4x = (\sin 8x + \sin 4x) \times (\sin 8x - \sin 4x)$ (1) $= (2\sin 6x \cos 2x)(2\cos 6x \sin 2x)$ $= (2\sin 6x \cos 6x)(2\sin 2x \cos 2x)$ (1/2) $= \sin 12x \sin 4x$ (1/2)	2	
	(b)	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = k$ (1)		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
		$\frac{a+b}{c} = \frac{k\sin A + k\sin B}{k\sin C}$ (½)		
		$= \frac{\sin A + \sin B}{\sin C}$		
		$= \frac{2\sin\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)}{2\sin\left(\frac{C}{2}\right)\cos\left(\frac{C}{2}\right)}$	2	
		$= \frac{\sin\left(\frac{180-C}{2}\right)\cos\left(\frac{A-B}{2}\right)}{\sin\left(\frac{C}{2}\right)\cos\left(\frac{C}{2}\right)}$		
		$= \frac{\cos\left(\frac{C}{2}\right)\cos\left(\frac{A-B}{2}\right)}{\sin\left(\frac{C}{2}\right)\cos\left(\frac{C}{2}\right)}$ (½)		6
		$= \frac{\cos\left(\frac{A-B}{2}\right)}{\sin\left(\frac{C}{2}\right)}$		
(c)		$\sin x = \frac{\sqrt{3}}{2}$		
		$\sin x = \sin\frac{\pi}{3}$ (1)		
		G.S, $x = n\pi + (-1)^n \frac{\pi}{3}$, $n \in Z$ (1)	2	
		Principal Soln $\frac{\pi}{3}, \frac{2\pi}{3}$		
		Remark (a) formula for $\sin C - \sin D$, $\sin C + \sin D$, $\sin 2x$ give (½) score each.		
		(b)  (½) score.		
		(c) formula for G.S of $\sin x = \sin y$ (1) score.		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
20	a)	$n = 41$ OR $n = 21$	1	
	b)	2^n	1	
	c)	$T_{r+1} = {}^nC_{r-2}\, x^{r-2}$	$\frac{1}{2}$	
		$T_r = {}^nC_{r-1}\, x^{r-1}$	$\frac{1}{2}$	
		$T_{r+1} = {}^nC_r\, x^r$	$\frac{1}{2}$	
		$\frac{{}^nC_{r-2}}{{}^nC_{r-1}} = \frac{1}{7}$	$\frac{1}{2}$	
		$n - 8r = -9$	$\frac{1}{2}$	6
		$\frac{{}^nC_{r-1}}{{}^nC_r} = \frac{7}{42}$	$\frac{1}{2}$	
		$n - 7r = -1$	$\frac{1}{2}$	
		$n = 55$ $r = 8$	$\frac{1}{2}$	
		Remarks $T_{r+1} = {}^nC_r\, a^{n-r}\, b^r$ give 1 $(a+b)^n$: $a=1, b=x$ give $\frac{1}{2}$		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
21	a)	$a = 2$	1	
		$t_1 + t_2 + t_3 + t_4 + t_5 = \frac{1}{4}[t_6 + t_7 + t_8 + t_9 + t_{10}]$	1	
		$a + a+d + a+2d + a+3d + a+4d$		
		$= \frac{1}{4}[a+5d + a+6d + a+7d + a+8d + a+9d]$		
		$5a + 10d = \frac{1}{4}[5a + 35d]$		6
		$15a = -5d$		
		$d = -6$	$\frac{1}{2}$	
		$t_{20} = a + 19d$		
		$= 2 + 19 \times -6 = -112$	$\frac{1}{2}$	
	b)	Analysing give 3 score	3	
		Remarks		
		a) Formulae for $S_n = \frac{n}{2}[2a + (n-1)d]$ OR $S_n = \frac{n}{2}[t_1 + t_n]$ give 1 score.		
		$S_5 = \frac{1}{4}$ [Sum of next five] give 1		

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Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
22	a)	3	1	
	b)	$y = \frac{\sin x - \cos x}{\sin x + \cos x}$		
		$\frac{dy}{dx} = \frac{(\sin x + \cos x)\frac{d}{dx}(\sin x - \cos x) - (\sin x - \cos x) \times \frac{d}{dx}(\sin x + \cos x)}{(\sin x + \cos x)^2}$	2	
		$= \frac{(\sin x + \cos x)(\cos x + \sin x) - (\sin x - \cos x) \times (\cos x - \sin x)}{(\sin x + \cos x)^2}$	1	6
		$= \frac{2}{(\sin x + \cos x)^2}$		
	c)	$f(x) = 2x$		
		$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$	1	
		$= \lim_{h \to 0} \frac{2(x+h) - 2x}{h}$	$\frac{1}{2}$	
		$= \lim_{h \to 0} \frac{2h}{h}$		
		$= 2$	$\frac{1}{2}$	
		Remark (a) $\lim_{x \to 0} \frac{e^x - 1}{x} = 1$ ($\frac{1}{2}$) (b) Quotient Rule give (1)		
		(c) For direct derivative give (1)		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
23	a)	x : 6 7 8 9 10 x^2 : 36 49 64 81 100 $Var(x) = 2$	1	
	b)			

Class	f	x	x^2	fx	fx^2
0-10	4	5	25	20	100
10-20	7	15	225	105	1575
20-30	16	25	625	400	10000
30-40	16	35	1225	560	19600
40-50	7	45	2025	315	14175
	50			1400	45450

3

$\Sigma f = 50 \quad \Sigma fx = 1400 \quad \Sigma fx^2 = 45450$

$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$ $\frac{1}{2}$

$= \frac{1400}{50} = 28$ $\frac{1}{2}$

$Var(x) = \frac{\Sigma fx^2}{\Sigma f} - \left(\frac{\Sigma fx}{\Sigma f}\right)^2$ $\frac{1}{2}$

$= 125$ $\frac{1}{2}$

6

Remarks

(b) Format of table give 2

Any alternate method give full score.

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Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
24	(a)	$A = \{4\}$ (1/2) $B = \{2,4,6\}$ (1/2) $S = \{1,2,3,4,5,6\}$ (i) $A \cap B = \{4\} \neq \phi$, A and B are mutually exclusive (1/2) (ii) $A \cup B = \{2,4,6\} \neq S$, A and B are not exhaustive (1/2)	2	
	(b)	$S = \{(Sun, mon), (mon, Tue), (Tue, wed), (wed, Thu), (Thu, Fri), (Fri, Sat), (Sat, Sun)\}$ $A = \{(Fri, Sat), (Thur, Fri)\}$ $P(A) = \frac{n(A)}{n(S)} = \frac{2}{7}$	2	6
	(c)	$P(R) = \frac{26}{52}$ (1/2) $P(K) = \frac{4}{52}$ (1/2) $P(R \text{ or } K) = P(R) + P(K) - P(R \cap K)$ (1/2) $= \frac{26}{52} + \frac{4}{52} - \frac{2}{52}$ $= \frac{28}{52} = \frac{7}{13}$ (1/2)	2	
		Remark : (a) For sample space (1) score. (b) Analyse (2) score. (c) formula for P(R or K) (1) score.		

N.B: Give full score for any correct alternate method.

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