XI STANDARD
HALF YEARLY EXAMINATION, DEC-2023

SUB: MATHEMATICS (ANSWER KEY-EM)
Max.Marks:90

PART - I (20 x 1= 20)

Q.No	Correct Choice	Correct Answer
1	b)	512
2	c)	3
3	a)	18
4	b)	2
5	c)	0
6	c)	$2cos^2\frac{x}{2}$
7	a)	$r!$
8	b)	$a \geq g$
9	c)	**37**
10	c)	$(-3,-2)$
11	d)	$k=3$
12	b)	0
13	c)	3
14	b)	$4\vec{j}+5\vec{k}$
15	c)	$\frac{15}{4}$
16	b)	$2(log2)^2$
17	a)	-1
18	d)	$\frac{x^3}{3}+c$
19	a)	$sin^{-1}\frac{x}{a}+c$
20	c)	$\frac{1}{2}$

PART - **II (7 x 2 = 14)**
Answer any 7 questions. Q.No. 30 is compulsory.

21	$g \circ f(x) = 9x^2 - 24x + 19$ → (1) $f \circ g(x) = 3x^2 + 5$ → (1)
22	$\frac{7+\sqrt{6}}{3-\sqrt{2}} = \frac{21+3\sqrt{6}+7\sqrt{2}+\sqrt{12}}{7}$ →(2)
23	Negative y-axis →(1) I-quadrant →(1)
24	$\frac{50!}{47!3!} = 19600$ →(1+1)
25	Intercept form $\frac{x}{a}+\frac{y}{b}=1$ →(1) Two point form $\frac{y-y_1}{y_2-y_1}=\frac{x-x_1}{x_2-x1}$ →(1)
26	Direction ratios $= (3,-3,4)$ →(1) Direction cosines $= \left(\frac{3}{\sqrt{34}}, \frac{-3}{\sqrt{34}}, \frac{4}{34}\right)$ →(1)
27	$\frac{dy}{dx} = \frac{dy/dt}{dx/dt}$ →(1) $= -\cot(t)$ →(1)
28	$\int cotx\ cosecx\ dx$ →(1) $= -cosecx + c$ →(1)
29	$1 - P(A \cap B)$ →(1) $= 0.85$ →(1)
30	$x = \frac{27}{8}$ → (2)

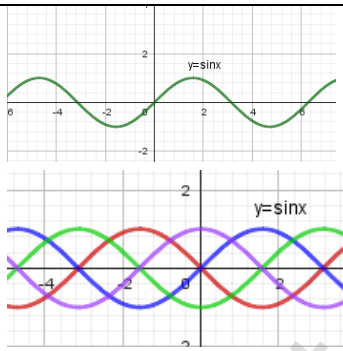
PART -III (7x3=21)

Answer any 7 questions. Q.No. 40 is compulsory.

Q.NO.	ANSWER KEY
31	When x>2 and x<-2 ;Nr is imaginary →(1) When $x = 3, -3$;f(x) is not defined →(1) Domain is an empty set →(1)
32	$\frac{1+tan\theta}{1-tan\theta} - \frac{1-tan\theta}{1+tan\theta}$ →(1) $= \frac{4tan\theta}{1-tan^2\theta} = 2tan2\theta$ →(2)
33	$(x+a)^n = nC_0x^n + nc_1x^{n-1}a + \cdots + a^n$ →(1) $= 16x^4 - 16x^2 + 6 - \frac{1}{x^2} + \frac{1}{16x^4}$ →(2)
34	Length of Perpendicular $= 7\sqrt{2}$ →(2) Point $(x, y) = (-3,5)$ →(1)
35	$A = \frac{1}{2}\begin{bmatrix} 2 & -3 & 1 \\ -3 & 16 & 9 \\ 1 & 9 & 10 \end{bmatrix} + \frac{1}{2}\begin{bmatrix} 0 & -9 & -9 \\ 9 & 0 & 3 \\ 9 & -3 & 0 \end{bmatrix}$ →(1+2)
36	**Mere attempt →(3)**
37	$\lim_{t\to 0} \frac{\sqrt{t^2+9}-3}{t^2} \times \frac{\sqrt{t^2+9}+3}{\sqrt{t^2+9}+3}$ →(1) $= \lim_{t\to 0} \frac{1}{\sqrt{t^2+9}+3} = \frac{1}{6}$ →(2)
38	$u = x + \sqrt{x}$ →(1) $\frac{dy}{dx} = \frac{1}{2\sqrt{x+\sqrt{x}}}\left[\frac{2\sqrt{x}+1}{2\sqrt{x}}\right]$ →(2*)
39	$u = x^2 \quad ; \; dv = e^{5x}dx$ →(1) $\int x^2e^{5x}dx = \frac{x^2e^{5x}}{5} - \frac{2xe^{5x}}{25} + \frac{2e^{5x}}{125} + c$ →(2)
40	$f(x) = \begin{cases} 2x+5 & ; x \geq 0 \\ -(2x+5); & x < 0 \end{cases}$ →(1) $f(-3) = 1 \quad \& \quad f(0) = 5$ →(1+1)

PART - IV (7 x 5 = 35)

Answer All the questions:

41(a)	 →(2) →(1+1+1)
41(b)	$sin18^\circ = \frac{\sqrt{5}-1}{4}$ →(3) $cos36^\circ = 1 - 2sin^2 18^\circ$ →(1) $cos36^\circ = \frac{\sqrt{5}+1}{4}$ →(1)
42(a)	$\frac{7+x}{(1+x)(1+x^2)} = \frac{A}{1+x} + \frac{Bx+C}{1+x^2}$ →(2) $= \frac{3}{x+1} + \frac{4-3x}{x^2+1}$ →(1+1+1)
42(b)	(i) Ecactly 3 women No of ways $= 8C_4 \times 4c_3 = 280$ →(1) (ii) atleast 3 women No of ways $= 280 + 56 = 336$ →(2) (iii) at most 3 women No of ways $= 8 + 112 + 336 + 280$ $= 736$ →(2)
43(a)	$\sqrt[n]{\frac{p}{q}} = \left[\frac{1+\frac{p-q}{p+q}}{1-\frac{p-q}{p+q}}\right]^{1/n}$ →(2) $\cong \left[\frac{1+\frac{1}{n}\left(\frac{p-q}{p+q}\right)}{1-\frac{1}{n}\left(\frac{p-q}{p+q}\right)}\right] = \frac{(n+1)p+(n-1)q}{(n-1)p+(n+1)q}$ →(2) $\sqrt[8]{\frac{15}{16}} \cong 0.99$ →(1)
43(b)	$\lambda = 2$ →(3*) $tan\theta = \left\lvert\frac{2\sqrt{h^2-ab}}{a+b}\right\rvert$ →(1) $\theta = tan^{-1}\left(\frac{1}{7}\right)$ →(1)
44(a)	$p = 0 \implies \lvert A\rvert = 0$ →(1) p, q, r are factors →(1) $p+q+r = 0 \implies \lvert A\rvert = 0$ →(1) $(p+q+r)^2$ is a factor →(1) $k = 2$ →(1)

44(b)	$\lim_{x\to 0} f(x) = f(0)$	→(1)
	$\lim_{x\to 1} f(x) = f(1)$	→(1)
	$\lim_{x\to 3} f(x) = f(3)$	→(1)
	f is continuous at $x = 0,1,3$	→(2)
45(a)	Rough diagram	→(1)
	$\overrightarrow{AB} = \overrightarrow{AE} + \overrightarrow{EF} + \overrightarrow{FB}$	→(1)
	$\overrightarrow{AD} = \overrightarrow{AE} + \overrightarrow{EF} + \overrightarrow{FD}$	→(1)
	$\overrightarrow{CB} = \overrightarrow{CE} + \overrightarrow{EF} + \overrightarrow{FB}$	→(1)
	$\overrightarrow{CD} = \overrightarrow{EE} + \overrightarrow{EF} + \overrightarrow{FD}$	→(1)
45(b)	$3x + 7 = \frac{3}{2}(2x + 4) - 1$	→(2)
	$\int \frac{3x+7}{x^2+4x+7} dx$	
	$= \frac{3}{2}\int \frac{2x+4}{x^2+4x+7} dx - \int \frac{1}{x^2+4x+7} dx$	→(1)
	$= \frac{3}{2} log\lvert x^2 + 4x + 7\rvert - \frac{1}{\sqrt{3}} tan^{-1}\left(\frac{x+2}{\sqrt{3}}\right) + c$	→(2)
46(a)	$y^1 = \frac{-2cos^{-1}x}{\sqrt{1-x^2}}$	→(1)
	$\sqrt{1-x^2}y^{11} - \frac{xy^1}{\sqrt{1-x^2}} = \frac{2}{\sqrt{1-x^2}}$	→(2)
	$(1-x^2)y^{11} - xy^1 - 2 = 0$	→(1)
	When $x = 0$; $y_2 = 2$	→(1)
46(b)	$P(A_i/B) = \frac{P(A_i)P(B/A_i)}{\sum P(A_i)P(B/A_i}$	→ (1)
	$P(A_i/B) = \frac{\left(\frac{4}{9}\right)\times 0.4}{\left(\frac{4}{9}\right)\times 0.3+\left(\frac{2}{9}\right)\times 0.5+\left(\frac{3}{9}\right)\times 0.4}$	→ (2)
	$= \frac{6}{17}$	→ (2)
47(a)	$LHS = sin\theta - tan\theta sec\theta$	→(2)
	$= \frac{11}{12} - \frac{11}{\sqrt{23}} \times \frac{12}{\sqrt{23}}$	→(2)
	$= \frac{-1331}{276}$	→(1)
47(b)	$y = u^2$; $u = logv$	
	$v = sinw$; $w = x^2 + 5$	→ (2)
	$\frac{dy}{dx} = \frac{4x\, log\left(sin(x^2+5)\right)}{sin(x^2+5)} \times cos(x^2 + 5)$	→ (3)

Note: Award full marks for correct alternate method also.