مدرسة دلهي الخاصة ذ.م.م.
DELHI PRIVATE SCHOOL L.L.C.
Affiliated to C.B.S.E., DELHI
(Approved & Recognized By Ministry of Education - United Arab Emirates)
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EEE CONSORTIUM
PREBOARD EXAMINATION 2021-2022
Marking scheme (TERM -II)
Set - I

Section– A

1.	Let I = $\int \left[\log(\log x) + \frac{1}{(\log x)^2}\right] dx = \int \log(\log x)\, dx + \int \frac{dx}{(\log x)^2}$ = $I_1 + I_2 + C$ (say) {C is arbitrary constant} Where $I_1 = \int \log(\log x)\, dx$ and $I_2 = \int \frac{dx}{(\log x)^2}$ $I_1 = \int \log(\log x) . 1\, dx$ $= \log(\log x) \int 1. dx - \int \left[\frac{d[\log [\log x]]}{dx} \int 1. dx\right] dx$ $= \log(\log x)(x) - \int \left[\frac{1}{\log x}.\frac{d(\log x)}{dx} \int 1. dx\right] dx$ $= \log(\log x)(x) - \int \left[\frac{1}{\log x}\right] dx$ $I_1 = xlog\, (\log x) - \frac{x}{\log x} - \int \frac{dx}{(\log x)^2}\, dx$ Now I = $I_1 + I_2 + C$ I = $I_1 + \int \frac{dx}{(\log x)^2}$ $= xlog\, (\log x) - \frac{x}{\log x} - \int \frac{dx}{(\log x)^2}\, dx + \int \frac{dx}{(\log x)^2}$ + C $= x \log(\log x) - \frac{x}{\log x} + C$ Hence I = $xlog\, (\log x) - \frac{x}{\log x} + C$ **OR** Let tan x = t $=> sec^2 x\, dx = dt$ $\int \frac{sec^2 x}{\sqrt{tan^2 x + 4}}\, dx = \int \frac{dt}{\sqrt{t^2 + 4}}$ $= \log\left|t + \sqrt{t^2 + 4}\right| + c$ $= \log\left|\tan x + \sqrt{tan^2 x + 4}\right| + c$	1 1 1 1
2.	Degree of the given differential equation = 3 Order of the given differential equation = 2 Hence, the sum of order and degree = 2 + 3 = 5	1 1
3.	Given $\left|\hat{a} + \hat{b}\right| = 1$ As we know that $\left|\hat{a} + \hat{b}\right|^2 + \left|\hat{a} - \hat{b}\right|^2 = 2\,(\lvert\hat{a}\rvert^2 + \left|\hat{b}\right|^2)$ $=> 1 + \left|\hat{a} - \hat{b}\right|^2 = 2\,(1 + 1)$ $=> \left|\hat{a} - \hat{b}\right|^2 = 3$	1 1

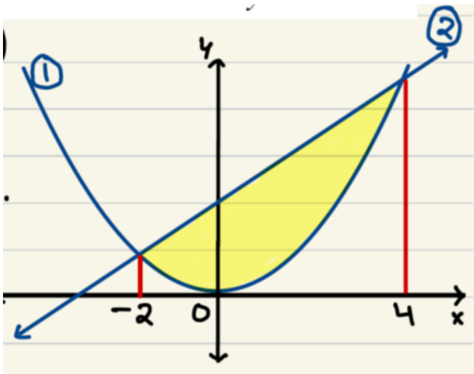
	$=> \lvert \hat{a} - \hat{b} \rvert = \sqrt{3}$	
4.	We know the direction cosines of the line passing through two points P(x_1 , y_1 , z_1) and Q(x_2, y_2 , z_2) are given by $$\frac{x_2 - x_1}{PQ} = \frac{y_2 - y_1}{PQ} = \frac{z_2 - z_1}{PQ}$$ Where $PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$ Here P is (-2, 4, -5) and Q is (1, 2, 3). So $PQ = \sqrt{(1-(-2))^2 + (2-4)^2 + (3-(-5))^2}$ $= \sqrt{77}$ Thus, the direction cosines of the line joining two points is $\frac{3}{\sqrt{77}}, \frac{-2}{\sqrt{77}}, \frac{8}{\sqrt{77}}$	**1** **1**
5.	Let X denote the number of milk chocolates drawn <table><tr><td>X</td><td>P(X)</td></tr><tr><td>0</td><td>$\frac{4}{6} X \frac{3}{5} = \frac{12}{30}$</td></tr><tr><td>1</td><td>$\left(\frac{2}{6} X \frac{4}{5}\right) X\ 2 = \frac{16}{30}$</td></tr><tr><td>2</td><td>$\frac{2}{6} X \frac{1}{5} = \frac{2}{30}$</td></tr></table>	**2**
6.	We know that the sample space is S = {1, 2, 3, 4, 5, 6} Now E = {3, 6}, F = {2, 4, 6} and E∩ F = {6} Then P(E) = $\frac{2}{6} = \frac{1}{3}$, P(F) = $\frac{3}{6} = \frac{1}{2}$ and P(E∩F) = $\frac{1}{6}$ Clearly P(E∩F) = P(E). P(F) Hence E and F are independent events.	**1** **1**
	<u>Section– B</u>	
7.	**Let** $\boldsymbol{x^2 = t}$; $x\,dx = \frac{dt}{2}$ $\boldsymbol{\frac{1}{2}\int \frac{t}{t^2+3t+2} dt}$ $\boldsymbol{\frac{t}{(t+2)(t+1)} = \frac{2}{t+2} + \frac{-1}{t+1}}$ = 2log(t+2)-log(t+1) = $log\left(\frac{(t+2)^2}{t+1}\right)$ = $log\left(\frac{(x^2+2)^2}{x^2+1}\right)$+ C	**½** **½** **1** **½** **½**
8.	$P = \frac{x^2-1}{x(x^2+1)} = \frac{A}{x} + \frac{Bx+C}{x^2+1} = \frac{-1}{x} + \frac{2x}{x^2+1}$ $\int \frac{-1}{x} + \frac{2x}{x^2+1} dx = -logx + \log(x^2+1)$ IF $\frac{x^2+1}{x}$ y. $\frac{x^2+1}{x} = \int logx.x\, dx$ y. $\frac{x^2+1}{x} = \frac{x^2}{4}(2logx - 1) + c$	**½** **½** **½** **½** **1**

	OR *y=vx* $x\frac{dv}{dx}=\frac{2sinv-v^2}{v-cosv}$ $\int\frac{v-cosv}{2sinv-v^2}dv=\int\frac{dx}{x}$ $-\frac{1}{2}logu+logc=logx\Rightarrow x\sqrt{u}=c$ $2x^2sin\left(\frac{y}{x}\right)-y^2=c^1$	**1** **1** **1**
9.	Let $\vec{c}=ai+bj+ck$ $\vec{a}\times\vec{c}=\begin{vmatrix}i & j & k\\1 & 1 & 1\\a & b & c\end{vmatrix}=i(c-b)-j(c-a)+k(b-a)$ $i(c-b)-j(c-a)+k(b-a)=j-k$ c-b=0 $\Rightarrow c=b;\ -1=c-a\Rightarrow a=c+1; b-a=-1\Rightarrow a=b+1$ a+b+c=3 1+b+b+b=3$\Rightarrow b=\frac{2}{3}; c=\frac{2}{3}; a=\frac{5}{3}$ $\vec{c}=\frac{5}{3}i+\frac{2}{3}j+\frac{2}{3}k$	**½** **½** **½** **+** **½** **+** **½** **½**
10.	Let (10 $\lambda+11,-4\lambda-2,-11\lambda-8$) be the point on the line d.r's of perpendicular line 10 $\lambda+9,-4\lambda-1,-11\lambda-13$ d.r's of the vector on the line 10 , -4 , -11 237 λ = -237 $\Rightarrow\ \lambda=-1$ Coordinate of the foot of the perpendicular is (1,2,3) Image of A is (0,3,5) **OR** d,r's $\overrightarrow{b_1}$ is 1,2,3 d.r's of $\overrightarrow{b_2}$ is -3,2,5 $\vec{b}\perp\overrightarrow{b_1},\vec{b}\perp\overrightarrow{b_2}\Longrightarrow\vec{b}\parallel\overrightarrow{b_1}\times\overrightarrow{b_2}$ $\overrightarrow{b_1}\times\overrightarrow{b_2}=\begin{vmatrix}i & j & k\\1 & 2 & 3\\-3 & 2 & 5\end{vmatrix}=4\hat{\imath}-14\hat{\jmath}+8\hat{k}$ $\vec{r}=2\hat{\imath}+\hat{\jmath}+3\hat{k}+\lambda(4\hat{\imath}-14\hat{\jmath}+8\hat{k})$	**½** **1** **½** **1** **½** **½** **1** **1**
	<u>Section– C</u>	
11.	$I=\int_{-1}^{2}\lvert x^3-x\rvert\,dx.$ $I=\int_{-1}^{0}(x^3-x)\,dx-\int_{0}^{1}(x^3-x)\,dx+\int_{1}^{2}(x^3-x)\,dx$	**1** **1**

$$I=\left[\frac{x^4}{4}-\frac{x^2}{2}\right]_{-1}^{0}-\left[\frac{x^4}{4}-\frac{x^2}{2}\right]_{0}^{1}+\left[\frac{x^4}{4}-\frac{x^2}{2}\right]_{1}^{2}$$ **1**

$$I=-\left(\frac{1}{4}-\frac{1}{2}\right)+\left(\frac{1}{2}-\frac{1}{4}\right)+(4-2)-\left(\frac{1}{4}-\frac{1}{2}\right)=\frac{3}{2}-\frac{3}{4}+2=\frac{11}{4}$$ **1**

12. $4y=3x^2\ldots(1)$ and $3x-2y+12=0\ldots(2)$



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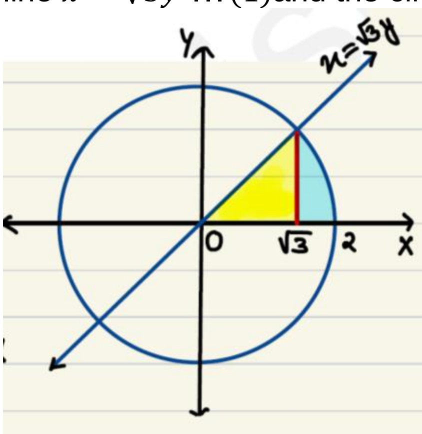
Point of intersection: $x=-2,4$

$$Area=\int_{-2}^{4}\left(\frac{3x+12}{2}-\frac{3x^2}{4}\right)dx=\left[\frac{3x^2}{4}+6x-\frac{x^3}{4}\right]_{-2}^{4}$$

$$Area=\left(3\times\frac{16}{4}+24-\frac{64}{4}\right)-(3-12+2)\ =\ 20-(-7)=27\ sq\ units$$

OR

line $x=\sqrt{3}y\ \ldots(1)$and the circle $x^2+y^2=4\ldots(2)$



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Point of intersection :$x=\pm\sqrt{3}$

$$Area=\int_{0}^{\sqrt{3}}\frac{x}{\sqrt{3}}dx+\int_{\sqrt{3}}^{2}\sqrt{4-x^2}\,dx$$ **1**

$$Area=\frac{1}{2\sqrt{3}}[x^2]_0^{\sqrt{3}}+\left[\frac{x}{2}\sqrt{4-x^2}+2sin^{-1}\frac{x}{2}\right]_{\sqrt{3}}^{2}$$

$$Area=\frac{1}{2\sqrt{3}}[3-0]+\left[\left(0+2\times\frac{\pi}{2}\right)-\left(\frac{\sqrt{3}}{2}+2\times\frac{\pi}{3}\right)\right]$$

$$Area=\frac{\sqrt{3}}{2}+\pi-\frac{\sqrt{3}}{2}-\frac{2\pi}{3}=\frac{\pi}{3}\ sq\ units$$

13. Find the coordinates of the foot of perpendicular drawn from the point $A(-1,8,4)$ to the line joining the points $B(0,-1,3)$ and $C(2,-3,-1)$.

	Equation of line BC : $\frac{x-0}{2}=\frac{y+1}{-2}=\frac{z-3}{-4} \quad \Rightarrow \quad \frac{x-0}{1}=\frac{y+1}{-1}=\frac{z-3}{-2}=\lambda$ Let the foot of perpendicular from A be given by : $F(\lambda,-\lambda-1,-2\lambda+3)$ $Drs\ of\ AF:\ (\lambda+1),(-\lambda-9),(-2\lambda-1)$ Drs of BC : $1,-1,-2$ $AF \perp BC \ \Rightarrow \lambda+1+\lambda+9+4\lambda+2=0 \ \Rightarrow 6\lambda+12=0 \ \Rightarrow \lambda=-2$ $\therefore$ Foot of perpendicular : $F(-2,1,-1)$	**1** **1** **1** **1**
14.	**CASE -BASED/ DATA- BASED** Let B1, B2, B3 be the events that the bolts are manufactured by machines M1, M2 and M3 respectively. And E be the event that defective bolts are produced . $P(B1)=\frac{25}{100}$, $P(B2)=\frac{35}{100}$, $P(B3)=\frac{40}{100}$ $P(E\|B1)=\frac{5}{100}$, $P(E\|B2)=\frac{4}{100}$, $P(E\|B3)=\frac{2}{100}$	
	(i) $P(E)=P(B1)\times P(E\|B1)+P(B2)\times P(E\|B2)+P(B3)\times P(E\|B3)$ $P(E)=\frac{25}{100}\times\frac{5}{100}+\frac{35}{100}\times\frac{4}{100}+\frac{40}{100}\times\frac{2}{100}=\frac{345}{10000}=\frac{69}{2000}$	**1** **1**
	(ii) $P(B2\|E)=\frac{P(B2)\times P(E\|B2)}{P(B1)\times P(E\|B1)+P(B2)\times P(E\|B2)+P(B3)\times P(E\|B3)}$ $P(B2\|E)=\frac{\frac{35}{100}\times\frac{4}{100}}{\frac{25}{100}\times\frac{5}{100}+\frac{35}{100}\times\frac{4}{100}+\frac{40}{100}\times\frac{2}{100}}=\frac{140}{345}=\frac{28}{69}$	**1** **1**