XI - Public Exam - 2022 (May)

Mathematics - Tentative Answer Key

Part - I

Type - A

1. d) discontinuous
2. d) A+B is symmetric
3. b) e^4
4. d) 18
5. c) 10
6. c) N
7. c) does not exist
8. d) ∞
9. c) $\frac{2x^3}{3} - x^2 + x + C$
10. a) 0.56
11. a) $\sec\theta$
12. (b) $-2\hat{i} - \hat{j} + 9\hat{k}$
13. a) $2x^2 e^{x/2} - 8xe^{x/2} + 16e^{x/2} + c$
14. d) 5^5
15. c) $2/3$
16. d) $1/2, -2$
17. d) $\vec{b} - \vec{a}$
18. d) 8
19. c) 8
20. d) $1 - 2^{-n}$

Type - B

1. c) $2/3$
2. d) $1 - 2^{-n}$
3. a) $2x^2 e^{x/2} - 8xe^{x/2} + 16e^{x/2} + c$
4. c) N
5. b) e^4
6. d) ∞
7. d) discontinuous
8. d) 5^5
9. b) $-2\hat{i} - \hat{j} + 9\hat{k}$
10. a) $\sec\theta$
11. c) 8
12. d) 8
13. c) does not exist
14. d) $\frac{1}{2}, -2$
15. a) 0.56
16. c) 10
17. d) A+B is symmetric
18. d) $\vec{b} - \vec{a}$
19. d) 18
20. c) $\frac{2x^3}{3} - x^2 + x + c$

Prepared by
R. Dharmaraja M.Sc., M.Ed.,
CVB, CBE-46

Dear teachers,
If there is any correction then mail me:
dharmu2020@gmail.com

Part - II

21) $|2x-17| = 3$

$2x-17 = \pm 3$

$2x-17 = -3$ | $2x-17 = 3$

$2x = 14$ | $2x = 20$

$x = 7$ | $x = 10$

22) $\sin 50^\circ + \sin 20^\circ$

$= 2\sin\frac{50+20}{2} \cdot \sin\frac{50-20}{2}$

$= 2\sin 35^\circ \sin 15^\circ$

23) $\cos 135^\circ$

$= \cos(180^\circ - 45^\circ)$

$= -\cos 45^\circ$

$= -1/\sqrt{2}$

24) 2^5

$= 32$

25) $a_n = \begin{cases} n & n = 1,2,3 \\ a_{n-1}+a_{n-2}+a_{n-3} & n > 3 \end{cases}$

$a_1 = 1,\ a_2 = 2,\ a_3 = 3$

$a_4 = a_1 + a_2 + a_3 = 6.$

26) $\overset{x_1, y_1}{(1,1)},\ \overset{x_2, y_2}{(-2,3)}$

$\frac{y-y_1}{y_2-y_1} = \frac{x-x_1}{x_2-x_1}$

$\frac{y-1}{2} = \frac{x-1}{-2-1}$

$\frac{y-1}{2} = \frac{x-1}{-3}$

$-3y+3 = 2x-2$

$\Rightarrow \boxed{2x+3y-5=0}$

27) $|A| = \begin{vmatrix} 0 & \sin\alpha & \cos\alpha \\ \sin\alpha & 0 & \sin\beta \\ \cos\alpha & -\sin\beta & 0 \end{vmatrix}$

$= 0 - \sin\alpha(-\cos\alpha\sin\beta) + \cos\alpha(-\sin\alpha\sin\beta)$

$= \sin\alpha\sin\beta\cos\alpha - \sin\alpha\sin\beta\cos\alpha$

$= 0$

28) $\vec{a} = 5\hat{i} - 3\hat{j} + 4\hat{k}$

$|\vec{a}| = \sqrt{25+9+16}$

$= \sqrt{50} = 5\sqrt{2}$

$\hat{a} = \frac{5\hat{i}-3\hat{j}+4\hat{k}}{5\sqrt{2}}$

29) $y = x^3+5x^2+3x+7$

$\frac{dy}{dx} = 3x^2+10x+3$

30) $I = \int (x-11)^7\, dx$

$= \frac{(x-11)^8}{8} + c$

Part - 3

31) $A = \{x : x = 4n+1,\ 2 \le n \le 5,\ n \in N\}$

$A = \{9, 13, 17, 21\}$

$n(A) = 4$

$n(P(A)) = 2^{n(A)} = 2^4 = 16.$

32) $\frac{x}{(x+3)(x-4)} = \frac{A}{x+3} + \frac{B}{x-4}$

$\Rightarrow x = A(x-4) + B(x+3)$

$x = -3$	$x = 4$
$A(-7) = -3$	$B(7) = 4$
$A = 3/7$	$B = 4/7$

$\therefore \frac{x}{(x+3)(x-4)} = \frac{3}{7(x+3)} + \frac{4}{7(x-4)}$

33) ACCESSIBILITY - 13

$= \frac{13!}{2!\,2!\,3!}$

$= 259,459,200$

34) $(x+2)^{-2/3}$ $\quad (1+x)^{-n} = 1 - nx + \frac{n(n+1)}{2!}x^2 - \dots$ $\quad |x|<1$

$= 2^{-2/3}(1 + x/2)^{-2/3}$

$= 2^{-2/3}\left\{1 - \left(\frac{2}{3}\right)\left(\frac{x}{2}\right) + \frac{\frac{2}{3}\left(\frac{2}{3}+1\right)}{2!}\left(\frac{x}{2}\right)^2 - \dots\right\}$ $\quad \{|x|<2$

$= \frac{1}{2^{2/3}}\left\{1 - \frac{x}{3} + \frac{5}{36}x^2 - \dots\right\}$; $|x|<2$

35) $D = \frac{|5x_1+12y_1-3|}{\sqrt{5^2+12^2}}$

$(1,2)$ $= \frac{|5+24-3|}{\sqrt{25+144}}$

$= \frac{26}{13}$

$= 2$ units.

36) $\Delta = \begin{vmatrix} 1 & 1 & 1 \\ x & y & z \\ x^2 & y^2 & z^2 \end{vmatrix}$

$C_1 \to C_1 - C_2$; $C_2 \to C_2 - C_3$

$= \begin{vmatrix} 0 & 0 & 1 \\ x-y & y-z & z \\ x^2-y^2 & y^2-z^2 & z^2 \end{vmatrix}$

$= (x-y)(y-z)\begin{vmatrix} 0 & 0 & 1 \\ 1 & 1 & z \\ x+y & y+z & z^2 \end{vmatrix}$

$= (x-y)(y-z)\{(y+z)-(x+y)\}$

$= (x-y)(y-z)(z-x)$

37) Let $\vec{a} = 5\hat{i}+3\hat{j}+4\hat{k}$

$\vec{b} = 6\hat{i}-8\hat{j}-\hat{k}$.

$\vec{a}\cdot\vec{b} = 30-24-4 = 2$

$|\vec{a}| = \sqrt{50}$; $|\vec{b}| = \sqrt{101}$

$\theta = \cos^{-1}\left(\frac{2}{5\sqrt{2}\times\sqrt{101}}\right)$

$= \cos^{-1}\left(\frac{\sqrt{2}}{5\sqrt{101}}\right)$

38) Given: $x^2+y^2 = 1$

Diff. w.r.t. x

$2x+2y\cdot y' = 0$

$\cancel{2}yy' = -\cancel{2}x$

$\boxed{\frac{dy}{dx} = -\frac{x}{y}}$

39) Given:

$f'(x) = 4x-5$

& $f(2) = 1$

$\int f'(x)dx = \int(4x-5)dx$

$= \left(4\times\frac{x^2}{2} - 5x\right)+c$

$f(x) = 2x^2-5x+c$

Also given $f(2) = 1$

$f(2) = 8-10+c$

$1 = -2+c$

$\boxed{c=3}$

$\therefore \boxed{f(x) = 2x^2-5x+3}$

40) $S = \{1,2,3,4,5,6\}$

$A \to$ Even no

$A = \{2,4,6\}$

$B = \{6\}$

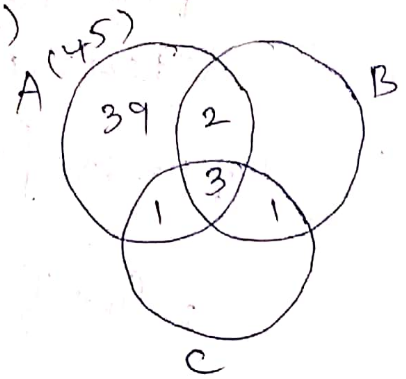
$A\cap B = \{6\}$

$P(B/A) = \frac{P(A\cap B)}{P(A)} = \frac{\frac{1}{6}}{\frac{3}{6}}$

$= \frac{1}{3}$

Part - IV

41) (a)



% only A = 39

Req. no of persons $= 5000 \times \frac{39}{100}$

$= 1950$.

41) (b)

$$I = \int \frac{2x+4}{x^2+4x+6}\,dx$$

$$= \log|x^2+4x+6| + c.$$

42) a) $\cot(180+\theta) = \cot\theta$

$\sin(90-\theta) = \cos\theta$

$\cos(-\theta) = \cos\theta$

* $\sin(270+\theta) = -\cos\theta$
* $\tan(-\theta) = -\tan\theta$.
* $\operatorname{cosec}(360+\theta) = \operatorname{cosec}\theta$

LHS: $\dfrac{\cot\theta \times \cos\theta \times \cos\theta}{(-\cos\theta)\times(-\tan\theta)\times(\operatorname{cosec}\theta)}$

$= \dfrac{\cot\theta \times \cos\theta \times \cos\theta}{\cancel{\cos\theta} \times \dfrac{\cancel{\sin\theta}}{\cancel{\cos\theta}} \times \dfrac{1}{\cancel{\sin\theta}}}$

$= \cos^2\theta \cdot \cot\theta$.

42) b) $I = \int x\cos x\,dx$

$u = x$ $\quad \int dv = \int \cos x\,dx$

$du = dx$ $\quad v = \sin x$

By parts,

$I = x\sin x - \int \sin x\,dx$

$\boxed{I = x\sin x + \cos x + C}$

43) a)

Let $P(n): 1^3+2^3+\cdots+n^3 = \left(\frac{n(n+1)}{2}\right)^2$

$n=1$ LHS = RHS = 1

$\therefore P(1)$ is true.

$n=k$ Assume $P(k)$ true

ie. $P(k): 1^3+2^3+\cdots+k^3 = \left(\frac{k(k+1)}{2}\right)^2$

$n=k+1$

$P(k+1): 1^3+2^3+\cdots+k^3+(k+1)^3 = \left(\frac{(k+1)(k+2)}{2}\right)^2$

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

$= (k+1)^2\left(\frac{k^2}{4} + (k+1)\right)$

$= \frac{(k+1)^2(k+2)^2}{4} = \left(\frac{(k+1)(k+2)}{2}\right)^2$

$\therefore P(n)$ true $\forall n \in N$

43) b) $x = a(t-\sin t)$ $\quad y = a(1-\cos t)$

$\frac{dx}{dt} = a(1-\cos t)$ $\quad \frac{dy}{dt} = a(\sin t)$.

$$\frac{dy}{dx} = \frac{\cancel{a}(\sin t)}{\cancel{a}(1-\cos t)}$$

6

44) a) Eqn of pair of st.lines

$12x^2+2kxy+2y^2+11x-5y+2=0$

$a=12 \mid 2h=2k,\ h=k \mid b=2 \mid 2g=11,\ g=11/2 \mid 2f=-5,\ f=-5/2$ & $c=2$

Condition :

$abc+2fgh-af^2-bg^2-ch^2=0$

$\Rightarrow 4k^2+55k+175=0$

$(4k+35)(k+5)=0$

$\boxed{k=-5 \text{ (or) } k=-\frac{35}{4}}$

44) b)

$\lim_{x\to 0} \frac{\tan 2x}{\sin 5x}$

$= \lim_{x\to 0} \frac{\frac{\tan 2x}{2x}\times 2x}{\frac{\sin 5x}{5x}\times 5x}$

$= \frac{2}{5}$

45) a) RHS :

$= \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}^2$

$= \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} \times \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$

$= \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} \times \begin{vmatrix} -a & -b & -c \\ c & a & b \\ b & c & a \end{vmatrix}$ (In 2nd det. $R_2 \leftrightarrow R_3$)

$= \begin{vmatrix} 2bc-a^2 & c^2 & b^2 \\ c^2 & 2ca-b^2 & a^2 \\ b^2 & a^2 & 2ab-c^2 \end{vmatrix} = \text{LHS}$

45) (b)

LHS :

$\log\left(\frac{75}{16}\right)-2\log\left(\frac{5}{9}\right)+\log\left(\frac{32}{243}\right)$

$= \log 75-\log 16-\log 25+\log 81+\log 32-\log 243$

$= \log 3+\log 25-\log 16-\log 25+\log 81+\log 2+\log 16-\log 81-\log 3$

$= \log 2$

$=$ RHS .

46) a) Let

$\vec{OA} = 2\hat{i}+4\hat{j}+3\hat{k}$

$\vec{OB} = 4\hat{i}+\hat{j}+9\hat{k}$

$\vec{OC} = 10\hat{i}-\hat{j}+6\hat{k}$

$\vec{AB} = \vec{OB}-\vec{OA}$

$= 2\hat{i}-3\hat{j}+6\hat{k}$

$|\vec{AB}| = \sqrt{4+9+36} = 7$

$\vec{BC} = 6\hat{i}-2\hat{j}-3\hat{k}$

$|\vec{BC}| = 7$

$\vec{CA} = -8\hat{i}+5\hat{j}-3\hat{k}$

$|\vec{CA}| = \sqrt{98}$

we see that,

$|\vec{CA}|^2 = |\vec{AB}|^2+|\vec{BC}|^2$

$\therefore$ It forms a r.t Δle.

46 b) (i) $\cos 15°$

$= \cos(45° - 30°)$

$= \cos 45° \cos 30° + \sin 45° \sin 30°$

$= \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \times \frac{1}{2}$

$= \frac{\sqrt{3}+1}{2\sqrt{2}}$

(ii) $\tan 165°$

$= \tan(120° + 45°)$

$= \frac{\tan 120° + \tan 45°}{1 - \tan 120° \tan 45°}$

$= \frac{-\sqrt{3}+1}{1+\sqrt{3}}$

$\boxed{\tan 165° = \frac{1-\sqrt{3}}{1+\sqrt{3}}}$

47) a) $A_1, A_2 \rightarrow$ Urn I & Urn II

$B \rightarrow$ Event of selecting black ball

	Black	Red	T
Urn-I	6	4	10
Urn-II	2	2	4

$P(A_1) = \frac{1}{2}$

$P(A_2) = \frac{1}{2}$

$P(B/A_1) = \frac{6}{10}$

$P(B/A_2) = \frac{2}{4}$

(i) $P(B) = P(A_1) \cdot P(B/A_1) + P(A_2) \cdot P(B/A_2)$

$= \left(\frac{1}{2} \times \frac{6}{10}\right) + \left(\frac{1}{\cancel{2}} \times \frac{\cancel{2}}{4}\right)$

$= \frac{11}{20}$

(ii) $P(A_1/B) = \frac{P(A_1) \cdot P(B/A_1)}{P(B)}$

$= \frac{\frac{1}{2} \times \frac{6}{10}}{11/20}$

$= \frac{6}{11}$

Prepared by R. Dharmaraja M.Sc., M.Ed., CVB MHSS, CBE-46

47) b) $\sqrt{3}x + y + 4 = 0$

$\Rightarrow -\sqrt{3}x - y = 4$

Req. form: $x \cos\alpha + y \sin\alpha = p$

$\cos\alpha = \frac{-\sqrt{3}}{2}$, $\sin\alpha = -\frac{1}{2}$ & $p = \frac{4}{2} = 2$

$\alpha = 210° = \frac{7\pi}{6}$ & $p = 2$

NF:

$\boxed{x \cos\frac{7\pi}{6} + y \sin\frac{7\pi}{6} = 2}$