Test Pattern

ALLEN CAREER INSTITUTE KOTA (RAJASTHAN) — path to success

DISTANCE LEARNING PROGRAMME

(Academic Session : 2019 - 2020)

JEE(Main)
MAJOR TEST # 03
02-02-2020

JEE(Main) : LEADER TEST SERIES / JOINT PACKAGE COURSE

Test Type : FULL SYLLABUS

ANSWER KEY

PART-1 : PHYSICS

SECTION-I	Q.	1	2	3	4	5	6	7	8	9	10
	A.	D	B	A	A	A	C	B	A	B	C
	Q.	11	12	13	14	15	16	17	18	19	20
	A.	A	B	B	B	D	C	B	D	A	A
SECTION-II	Q.	1	2	3	4	5					
	A.	1	7	7	2	4					

PART-2 : CHEMISTRY

SECTION-I	Q.	1	2	3	4	5	6	7	8	9	10
	A.	B	A	C	A	D	C	D	C	B	D
	Q.	11	12	13	14	15	16	17	18	19	20
	A.	A	C	A	C	C	B	B	D	D	B
SECTION-II	Q.	1	2	3	4	5					
	A.	1	8	3	3	8					

PART-3 : MATHEMATICS

SECTION-I	Q.	1	2	3	4	5	6	7	8	9	10
	A.	B	A	C	C	C	A	D	D	D	D
	Q.	11	12	13	14	15	16	17	18	19	20
	A.	A	A	C	C	B	D	D	C	A	D
SECTION-II	Q.	1	2	3	4	5					
	A.	6	7	1	3	6					

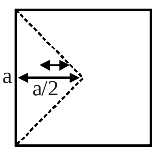
HINT – SHEET

PART-1 : PHYSICS

SECTION-I

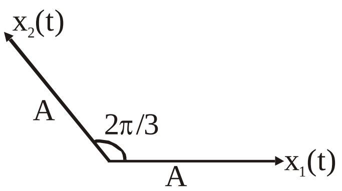
1. Ans. (D)

Sol. $$\frac{M\times 0-\frac{M}{4}\times -\frac{a}{3}}{M-\frac{M}{4}}=\frac{\frac{M_a}{12}}{\frac{3M}{4}}=\frac{a}{9}$$



2. Ans. (B)

Sol.



$x_1(t) + x_2(t) + x_3(t) = 0$

$x_3(t)$ has to be such that resultant is zero.

So it should make $\frac{4\pi}{3}$ from $x_1(t)$ anticlockwise.

3. Ans. (A)

Sol. Speed after t time $v = a_t$

$a_c = a_t$

$\frac{v^2}{R} = 2.$

$\frac{a^2t^2}{2} = 2, \frac{4t^2}{2}$

$t = 1\text{sec}$

4. Ans. (A)

Sol. $n_1u_1 = n_2u_2$

5. Ans. (A)

Sol. $\frac{V^2}{R} = kRt$

$V^2 = kR^2t$

$V = \sqrt{kR^2}\sqrt{t}$

$\frac{dv}{dt} = \sqrt{kR^2} \times \frac{1}{2\sqrt{t}}$

$= \frac{\sqrt{kR^2}}{2\sqrt{t}}$

F = Mat

$= \frac{M}{2} \times \sqrt{\frac{kR^2}{t}}$

P = F.V

$= \frac{M}{2} \times \sqrt{\frac{kR^2}{t}} \times \sqrt{kR^2t}$

$= \frac{MkR^2}{2}$

6. Ans. (C)

Sol. Least count = 1MSD – 1VSD

$= 0.5 \text{ mm} - \left(\frac{49}{50}\right)(0.5 \text{ mm}) = 0.001 \text{ cm}$

Reading = 7.45 + 29 × 0.001 = 7.479 cm

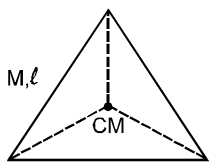
7. Ans. (B)

Sol. MI of the system w.r.t an axis ⊥ to plane & passing through one corner

$= \frac{ML^2}{3} + \frac{ML^2}{3} + \left[\frac{\mu L^2}{12} + \mu\left(\frac{\sqrt{3}\ L}{2}\right)^2\right]$

$= \frac{2ML^2}{3} + \left[\frac{ML^2}{12} + \frac{3ML^2}{4}\right]$

$= \frac{2ML^2}{3} + \frac{10\,ML^2}{12} = \frac{3ML^2}{3} = \frac{18ML^2}{12} = \frac{3}{2}ML^2$

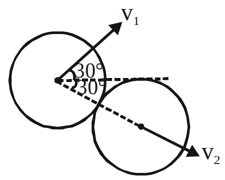


Now $\frac{3}{2}$ $ML^2 = 3k^2$

$k = \frac{\ell}{\sqrt{2}}$ **[Ans.** $\frac{\ell}{\sqrt{2}}$ **]**

8. Ans. (A)

Sol.



$\sin\beta = \frac{r}{2r} \Rightarrow \beta = 30°$

$mv_1 \sin 30° = mv_2 \sin 30° \Rightarrow v_1 = v_2$

$m \times 2 = mv_1 \cos 30° + mv_2 \cos 30°$

$K_{loss} = K_{final} - K_{initial}$

9. Ans. (B)

10. Ans. (C)

11. Ans. (A)

Sol. By analogy with Gauss Theorem; in gravitation, we have

$mr\omega^2$ or $\frac{mv^2}{r} = m \times \frac{2G\lambda}{r}$ ... (1)

$\Rightarrow T = \pi r\sqrt{\frac{2}{\lambda G}}$

also from equation (1)

$KE = \frac{1}{2}mv^2 = \lambda Gm$

12. Ans. (B)

Sol. $V = \frac{kQ}{2R}\left(3 - \frac{r^2}{R^2}\right)$

$0 + \frac{kQq_1}{2R}\left(3 - \frac{1}{4}\right) = \frac{1}{2}mv^2 + \frac{kQq_1}{(2R)}$

$\frac{kQq_1}{2R}\left(\frac{11}{4}\right) = \frac{1}{2}mv^2 + \frac{kQq_1}{2R}$

$\frac{kQq_1}{R}\left(\frac{11}{8} - \frac{1}{2}\right) = \frac{1}{2}mv^2$

$\frac{7}{8} \cdot \frac{kQq_1}{R} = \frac{1}{2}mv^2$

$v = \frac{\sqrt{7}}{2}\sqrt{\frac{kQq_1}{mR}}$

13. Ans. (B)

Sol. $\frac{1}{R_{eq.}}=\frac{1}{R_1}+\frac{1}{R_2} \Rightarrow R_1=\frac{\rho_1 L}{A_1}=\frac{\rho_1 L}{\pi\left(b^2-a^2\right)}$

$R_2=\frac{\rho_1 L}{2A_2}=\frac{\rho_1 L}{2\pi a^2}=\frac{\pi\left(b^2-a^2\right)}{\rho_1 L}+\frac{2\pi a^2}{\rho_1 L}$

$\frac{1}{R_{eq.}}=\frac{\pi\left(b^2+a^2\right)}{\rho_1 L}$

14. Ans. (B)

Sol. Spacing between successive nodes = $\frac{\lambda}{2}$

using V = nλ

$\lambda \propto V \propto \sqrt{\frac{T}{\mu}}$

New $\frac{\lambda'}{\lambda}=\frac{\sqrt{2T}}{\sqrt{T}} \Rightarrow \lambda'=\sqrt{2}\,\lambda$

$\frac{\lambda'}{2}=\sqrt{2}.\frac{\lambda}{2}=\sqrt{2}\,x$ **Ans.**

15. Ans. (D)

16. Ans. (C)

Sol. Since $V_{liquid} > V_{Air}$

i.e. liquid is rarer than air for sound waves

Angle of total internal reflection (critical angle)

$=\sin^{-1}\left(\frac{v_{liq}}{v_{air}}\right)=\sin^{-1}\left(\frac{1}{2}\right)=30^o$

Hence sound wave is totally reflected back.

17. Ans. (B)

Sol. $\frac{n_1 D\lambda_1}{d}=\frac{n_2 D\lambda_2}{d}\,;\ \frac{n_1}{n_2}=\left(\frac{D\lambda_2}{d}\right)/\left(\frac{D\lambda_1}{d}\right)$

$\Rightarrow$ LCM of $\frac{D\lambda_1}{d}$ and $\frac{D\lambda_2}{d}$

18. Ans. (D)

Sol. $V=\frac{kQ}{0.1}=15\times10^3 \Rightarrow Q=\frac{1.5\times10^3}{k}$

$V'=\frac{kq}{0.1}=\frac{k(Q-q)}{R}=10\times10^3$

$\Rightarrow q=\frac{10^3}{k}, R=\frac{0.5\times10^3}{10\times10^3}=5cm$

19. Ans. (A)

Sol. Momentum of the incident photon $p=\frac{h}{\lambda}$,

Momentum after reflection = $-\frac{h}{\lambda}$

Change in momentum = $\Delta p=\frac{2h}{\lambda}$

If n is the number of photons falling per second on the screen then force

$F=\frac{\Delta p}{\Delta t}=\frac{2h}{\lambda\times\frac{1}{n}}=\frac{2nh}{\lambda}$

$\Rightarrow n=\frac{F\lambda}{2h}=\frac{1\times6600\times10^{-9}}{2\times6.6\times10^{-34}}=5\times10^{27}$

photons s^{-1}

20. Ans. (A)

SECTION-II

1. Ans. 1

Sol. $E=\frac{Kq_{in}}{r^2}=\frac{K.\rho\times\frac{4}{3}\pi r^3}{r^2}\propto\frac{r^{n+3}}{r^2}$

For E to be proportional to r^2, n =1

2. Ans. 7

Sol. $u=-\left(4+\frac{4}{2}\right)\times2=-12\,cm$

$\frac{1}{v}+\frac{1}{-12}=\frac{1}{-8}$

$\Rightarrow v=-24$ cm.

for final image (refraction through plane surface) we can write.

$24=2\left(\frac{x}{1}+\frac{4}{2}\right)$

$\Rightarrow 24=2x+4$

x = 10 cm

so distance from P is 14 cm.

3. Ans. 7

Sol. $w=\int PdV\,;\ P=\frac{nRT}{V}\,;\ P=\alpha nRV$

$\Rightarrow n\alpha R\int_{V_0}^{6V_0}Vdv=\frac{n\alpha R}{2}\left[(6V_0)^2-(V_0)^2\right]$

$w=\frac{h\alpha R}{2}(35)V_0^2=\frac{P_0V_0\times35}{2}\,;\ \left(\because \alpha=\frac{P_0}{nRV_0}\right)$

4. **Ans. 2**

Sol. $\Delta P(x) = \Delta P_0 \sin [2\pi (vt - x)]$

Standing wave created in pipe

$\Delta P(x) = 2\Delta P_0 \sin (2\pi x) \cos (\omega t)$

$[\Delta P]_{max} = 2\Delta P_0$

$f_{max} = f = 2\Delta P_0 A$

$= (2 \times 2 \times 10^3 \times 5 \times 10^{-4})$

$f = 2$ N

5. **Ans. 4**

Sol. Volumetric strain $= \frac{\Delta V}{V} = \frac{Ads}{Adx} = \frac{ds}{dx}$

Also by $P = -\beta \frac{ds}{dx}$

$\Rightarrow \left|\frac{ds}{dx}\right| = \frac{P}{\beta}$

At x = 7m ; t = 1 sec.

$\left|\frac{ds}{dx}\right| = \frac{P}{\beta} = \frac{6 \times 10^{-3}}{1.5 \times 10^5} = 4 \times 10^{-8}$

PART-2 : CHEMISTRY

SECTION-I

1. **Ans. (B)**

2. **Ans. (A)**

Change in P.E. $= \frac{-2x}{4} + 2x = \frac{3x}{2}$

3. **Ans. (C)**

$KClO_3 \rightarrow KCl + \frac{3}{2} O_2$

m

Mass Decomposed $= \frac{50m}{100}$ $\quad \frac{3}{2} \times \frac{50m}{100 \times 122.5}$

$= \frac{67.2}{22.4}$,

moles $= \frac{50m}{100 \times 122.5}$, m = 490 gm

4. **Ans. (A)**

$NH_2COONH_4(s) \rightleftharpoons 2NH_3(g) + CO_2(g)$

$-$ $\quad \frac{2}{3}X \quad \frac{1}{3}X$

$K_p = \left(\frac{4}{9}X^2\right)\left(\frac{1}{3}X\right)$

$\Delta G^o = -RT\ln Kp$

$= (-RT)\left[\ln\frac{4}{27} + 3\ln X\right]$

5. **Ans. (D)**

6. **Ans. (C)**

$\overset{1.5\ -2}{P_4S_3} \longrightarrow \underset{14e^-}{\overset{+5}{2P_2O_5}} + \underset{18e^-}{\overset{+4}{3SO_2}}$

7. **Ans. (D)**

$\frac{r^+}{r^{-1}} = \frac{2.5}{2.6}$

$0.732 \le \frac{r^+}{r^-} < 1$

$\frac{a\sqrt{3}}{2} = (r^+ + r^-)$

$\frac{a \times 1.7}{2} = 5.1 \Rightarrow$ a = 6 Å

8. **Ans. (C)**

9. **Ans. (B)**

10. **Ans. (D)**

11. **Ans. (A)**

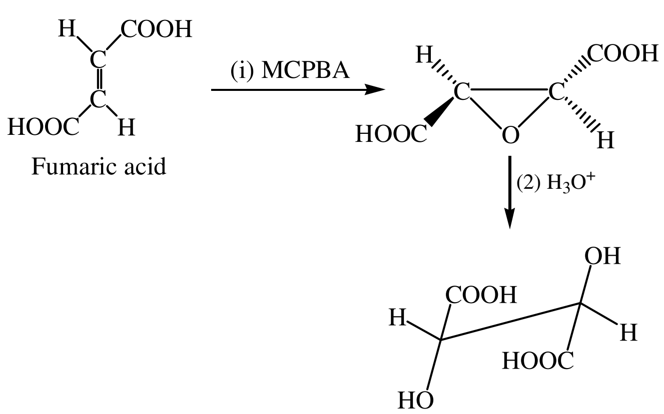
12. **Ans. (C)**

13. **Ans. (A)**

14. **Ans. (C)**

15. **Ans. (C)**

16. **Ans. (B)**



Only (B) is meso

(A) & (C) are optically active

17. Ans. (B)

18. Ans. (D)

19. Ans. (D)

20. Ans. (B)

SECTION-II

1. Ans. (1)

$$B^+ + H_2O \longrightarrow BOH + H^+$$

$1 - x \qquad\qquad x \qquad 10^{-2} + x$

$$\frac{(10^{-2}+x)(x)}{1-x} = 10^{-4} = 0$$

$x^2 + 10^{-2}x - 10^{-2}$

$[H^+] = 1.62 \times 10^{-2}$

2. Ans. (728) OMR ANS (8)

Sol. $8e^- + 2\ Ph - NO_2 \longrightarrow Ph - N = N - Ph$

$$OH^- \longrightarrow \frac{1}{4}O_2 + \frac{1}{2}H_2O + e^-$$

$$C_{60} + 60\ O_2 \longrightarrow 60\ CO_2$$

$$\frac{96}{60\times12}\times60\times4\times\frac{1}{8}\times182 \Rightarrow 728 \text{ gm}$$

3. Ans. (3)

4 . Ans. (3)

5. Ans. (8)

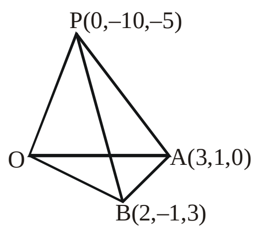
PART-3 : MATHEMATICS

SECTION-I

1. Ans. (B)

Vector perpendicular to plane OAB

$= \overrightarrow{OA}\times\overrightarrow{OB}$



$= (3\hat{i}+\hat{j})\times(2\hat{i}-\hat{j}+3\hat{k})$

$= 3\hat{i}-9\hat{j}-5\hat{k}$

$\therefore$ Equation of plane OAB = $3x - 9y - 5z + \lambda = 0$

$\because$ passes through OAB : $3x - 9y - 5z = 0$

length of perpendicular

$$= \frac{3\times0+90+25}{\sqrt{9+81+25}} = \sqrt{115}$$

2. Ans. (A)

$f'(x) = 3x^2 + a$, Given $f'(a) = f'(b)$

$\Rightarrow 3a^2 + a = 3b^2 + a \Rightarrow a = -b$

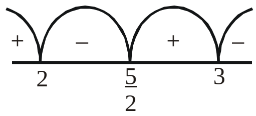
$\Rightarrow a + b = 0.$

Now, $f(1) = 1 + a + b = 1.$

3. Ans. (C)

$f(x) = \log_{1/3}(x^2 - 5x + 6)$: Domain of $f(x)$ is $x < 2$ or $x > 3$.

$$f(x) = \frac{\ell n\left(x^2-5x+6\right)}{-\ell n3}$$



$$f'(x) = -\frac{1}{\ell n3}\cdot\left(\frac{(2x-5)}{x^2-5x+6}\right)$$

$$= -\frac{1}{\ell n3}\cdot\frac{(2x-5)}{(x-2)(x-3)}$$

$\therefore f'(x) > 0$ for $x \in (-\infty, 2)$

4. Ans. (C)

$$\int_1^{e^a} f(x)dx = ae^a$$

differentiating w.r.t. a

$e^a f(e^a) = e^a(a + 1)$

put $e^a = x$

$f(x) = 1 + \ell nx$

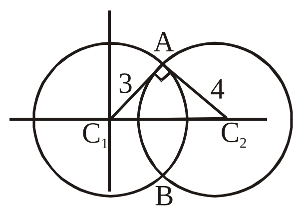
5. Ans. (C)

$$\left(x+\frac{1}{x}\right)\left(x^2-\frac{1}{x^2}\right)^9$$

$$\left(x+\frac{1}{x}\right)\sum {}^9C_r(-1)^r x^{18-4r}$$

Coefficient of x^5 is given by r = 3

6. Ans. (A)



$S_1 \equiv x^2 + y^2 = 9$ & $S^2 \equiv (x - 5)^2 + y^2 = 4^2$

Clearly S_1 & S_2 cuts each other orthogonally

$\therefore$ Required circle is a circle whose diameter is C_1C_2

$\therefore x(x - 5) + y^2 = 0$

7. Ans. (D)

$$\arg(3+2x+|z|i)=\frac{\pi}{4}$$

$$\frac{\sqrt{x^2+y^2}}{2x+3}=1 \qquad \left(x>-\frac{3}{2}\right)$$

$\Rightarrow x^2 + y^2 = 4x^2 + 9 + 12x$

$\Rightarrow 3(x + 2)^2 - y^2 = 3$

$$\Rightarrow \frac{(x+2)^2}{1}-\frac{y^2}{3}=1$$

$$\text{L.R.} = \frac{2b^2}{a}=6$$

8. Ans. (D)

$$f(x)=\begin{cases}2x+\tan^{-1}x+b & x<0\\ x^3+x^2+ax+c & x\ge 0\end{cases}$$

$\because$ Continuous at x = 0

$\Rightarrow$ b = c $\Rightarrow$ $\frac{b}{c}=1$

$\because$ differentiable at x = 0

$\Rightarrow$ 2 + 1 = a $\Rightarrow$ a = 3

$$\frac{b^2}{c^2}+a=4$$

9. Ans. (D)

$\because e^{-x}dy = (x^2 + 2x)dx$

$\Rightarrow dy = (x^2 + 2x)\, e^x.dx$

Integrating

$y = x^2e^x + c$. Put $x = 0 \Rightarrow c = 0$

$\therefore y = x^2e^x$

$$\frac{dy}{dx}=x(x+2).e^x=0 \Rightarrow x = -2,0.$$

$\therefore$ Local maximum value of $f(x) = f(-2) = \frac{4}{e^2}$

Now, $\frac{d^2y}{dx^2}=e^x(x^2+4x+2)$

$\because x^2 + 4x + 2 = 0$ has two distinct real roots.

$\therefore f(x)$ two inflection points.

Also, $\int_0^1 e^x dx = (e^x)_0^1 = e-1$

10. Ans. (D)

Let $I=\int_a^b \frac{f\left(\frac{x}{a}\right)-f\left(\frac{b}{x}\right)}{x}dx$

Put $x=\frac{ab}{t} \Rightarrow dx=-\frac{ab}{t^2}dt$

$$I=\int_b^a \frac{\left(f\left(\frac{b}{t}\right)-f\left(\frac{t}{a}\right)\right)t}{ab}\left(-\frac{ab}{t^2}\right)dt$$

$$=-\int_a^b \frac{f\left(\frac{t}{a}\right)-f\left(\frac{b}{t}\right)}{t}dt$$

$\therefore I = -I \Rightarrow 2I = 0 \Rightarrow I = 0$

11. Ans. (A)

$C_2 \to C_2 - C_3$

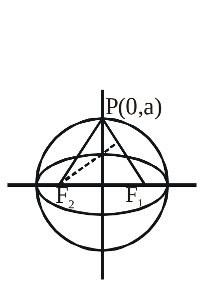
$$\begin{vmatrix} a_1a_2 & d & a_0\\ a_2a_3 & d & a_1\\ a_3a_4 & d & a_2\end{vmatrix}$$

$R_3 \to R_3 - R_2$ & $R_2 \to R_2 - R_1$

$$\begin{vmatrix} a_1a_2 & d & a_0\\ a_2(2d) & 0 & d\\ a_3(2d) & 0 & d\end{vmatrix} = -2d^3(a_2 - a_3) = 2d^4$$

12. Ans. (A)

$m_{F_2H}.m_{PF_1}=-1$



$$\Rightarrow \frac{b}{ae}\left(-\frac{a}{ae}\right)=-1$$

$$\Rightarrow \frac{b}{a}=e^2$$

$\Rightarrow 1 - e^2 = e^4 \Rightarrow e^4 + e^2 - 1 = 0$

$$\Rightarrow e^2=\frac{-1+\sqrt{5}}{2}=2\sin 18^\circ$$

13. Ans. (C)

LHS = $90f(x-3) - 100f(x+4) + 10f(x-3) = 0$

$\Rightarrow f(x-3) = f(x+4)$

$\Rightarrow f(x+7) = f(x)$

$\Rightarrow f(x)$ has period 7.

14. Ans. (C)

Let mid point be (h,k)

chord with mid point (h,k) is T =

$\Rightarrow 3(hx) - 2(ky) + 6\left(\frac{h+x}{2}\right) - 4\left(\frac{y+k}{2}\right)$

$= 3h^2 - 2k^2 + 6h - 4k$

$\Rightarrow$ slope $\left(\frac{3h+3}{(2k+2)}\right) = 2$

$\Rightarrow 3h + 3 = 2(2k + 2)$

$\Rightarrow 3h + 3 = 4k + 4$

$\Rightarrow 3x - 4y = 1$

15. Ans. (B)

$$I = \frac{1}{2}\int \frac{\left(2x + 2 - \frac{2}{x^3}\right)dx}{\sqrt{x^2 + \frac{1}{x^2} + 2x}}$$

put $x^2 + \frac{1}{x^2} + 2x = t^2$

$\Rightarrow \quad 2x - \frac{2}{x^3} + 2dx = 2tdt$

$\therefore \ I = \frac{1}{2}\int \frac{2tdt}{t} = t + c$

$= \sqrt{x^2 + \frac{1}{x^2} + 2x} = \frac{\sqrt{x^4 + 2x^3 + 1}}{x} + c$

16. Ans. (D)

$$\lim_{x\to 0} \frac{\ell n\left(1+3x^2\right)\sin\left(\tan^{-1}x\right)}{\left(3^x - 1\right)\left(1 - \cos 2x\right)}\left[\frac{\tan x}{x}\right]$$

$$= \lim_{x\to 0} \frac{(3x^2)(x)}{(x\ell n3)\left(\frac{4x^2}{2}\right)}(1) = \frac{3}{2\ell n3}$$

17. Ans. (D)

(A) For n = odd, B^n is skew-symmetric

(B) For n = 3, $|B| = 0 \Rightarrow B^{-1}$ does not exist.

(C) In this case $|c| = 0$ but $|A| = 0$ not always true.

(D) Let $A = \begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$ therefore

$$B = \begin{bmatrix} 0 & h & g \\ -h & 0 & f \\ -g & -f & 0 \end{bmatrix}$$

$\therefore$ C = A + B = $\begin{bmatrix} a & 2h & 2g \\ 0 & b & 2f \\ 0 & 0 & c \end{bmatrix}$ = an upper

Δ matrix

18. Ans. (C)

$y = 2 - e^{-x} \quad \Rightarrow \quad e^{-x} = 2 - y$

$\Rightarrow \quad -x = \ell n(2 - y)$

$\Rightarrow \quad g(x) = -\ell n(2 - x)$

$\Rightarrow \quad g'(x) = \frac{1}{2-x}$

$\Rightarrow \quad g''(x) = \frac{1}{(2-x)^2}$

$\Rightarrow \quad g''(1) = 1$

19. Ans. (A)

$\sim(\sim p \vee p) = p \wedge - p = f$

$\sim(q \vee \sim q) = -q \wedge q = f$

$f \wedge f = f$ is contradiction

20. Ans. (D)

If variance of $\sum x_i$ is v

then variance of $\sum ax_i + b$ will be a^2v

SECTION-II

1. Ans. 6

First three prime numbers are 2,3 and 5.

for real roots $D \geq 0 \Rightarrow b^2 - 4ac \geq 0$

so $b \neq 2, b \neq 3 \Rightarrow b = 5$

$\therefore$ b = 5, a = 2, b = 3

& b = 5, a = 3, b = 2 i.e. in two ways.

Total number of ways of choosing a,bc

$= 3 \times 2 \times 1 = 6$

$\therefore$ required probability

$$= \frac{2}{6} = \frac{1}{3} = P \Rightarrow 18P = 6$$

2. Ans. 7

$a + b + c = 8$

$ab + bc + ca = 12$

$c = 8 - (a + b)$

$ab + b(8 - (a + b)) + a(8 - (a + b)) = 12$

$ab + 8b - ab - b^2 + 8a - a^2 - ab - 12 = 0$

$b^2 + b(a - 8) + a^2 - 8a + 12 = 0$

$D \geq 0$

$(a - 8)^2 - 4(a^2 - 8a + 12) \geq 0$

$a^2 - 16a + 64 - 4a^2 + 32a - 48 \geq 0$

$3a^2 - 16a - 16 \leq 0$

number of integral values of a is 0,1,2,3,4,5,6

3. Ans. 1

$$S_{(2K-1)} = \frac{(2K-1)}{2}(3 + (2K-2))$$

$$S_{(2K-1)} = \frac{(2K-1)(2K+1)}{2}$$

$$\sum_{K=1}^{\infty} \frac{1}{S_{(2K-1)}} = 2\sum \frac{1}{(2K-1)(2K+1)}$$

$$= \frac{1}{1} - \frac{1}{3} + \frac{1}{3} - \frac{1}{5} + \ldots\ldots\ldots\ldots = 1$$

4. Ans. 3

Let $\vec{A} = p\hat{i} + q\hat{j} + r\hat{k}$

& $\vec{B} = k\hat{i} + y\hat{j} + z\hat{k}$

then $\vec{A}.\vec{B} = px + qy + rz$

and $|\vec{A}|.|\vec{B}| = \sqrt{\left(p^2 + q^2 + r^2\right)\left(x^2 + y^2 + z^2\right)}$

then px + qy + rz

$= -\sqrt{\left(p^2 + q^2 + r^{-2}\right).\left(r^2 + y^2 + z^2\right)}$

$\Rightarrow \vec{A}.\vec{B} = -|\vec{A}|.|\vec{B}| \Rightarrow \vec{A}$ and $\vec{B}$ are antiparallel.

$\Rightarrow \frac{p}{x} = \frac{q}{y} = \frac{r}{z} = k$ then $\frac{py}{qx} + \frac{qz}{ry} + \frac{rx}{pz} = 3$

5. Ans. 6

$N = {}^8C_4.1.4! - {}^8C_5.1.3!$

= 1344

= 1350 – N = 6