

**MEMORY BASED QUESTIONS JEE-MAIN EXAMINATION – APRIL 2026**

(HELD ON SATURDAY 04<sup>th</sup> APRIL 2026)

TIME : 9:00 AM TO 12:00 NOON

**MATHEMATICS**

**TEST PAPER WITH SOLUTION**

1. If  $\vec{a}_R = \tan \theta_R \hat{i} + \hat{j}$  &  $\vec{b}_R = \hat{i} - \cot \theta_R \hat{k}$  where

$$\theta_R = \frac{2^{R-1} \pi}{2^N + 1} \text{ then the value of } \frac{\sum_{R=1}^N |\vec{a}_R|^2}{\sum_{R=1}^N |\vec{b}_R|^2} \text{ is}$$

- (1) 1 (2) 2  
(3) 3 (4) 4

Ans. (1)

Sol.  $|\vec{a}_R|^2 = \sec^2 \theta_R$   $|\vec{b}_R|^2 = \operatorname{cosec}^2 \theta_R$

$$S = \frac{\sec^2 \frac{\pi}{2^N + 1} + \sec^2 \frac{2\pi}{2^N + 1} + \dots + \sec^2 \frac{2^{N-1} \pi}{2^N + 1}}{\operatorname{cosec}^2 \frac{\pi}{2^N + 1} + \operatorname{cosec}^2 \frac{2\pi}{2^N + 1} + \dots + \operatorname{cosec}^2 \frac{2^{N-1} \pi}{2^N + 1}}$$

$$S = \frac{\sec^2 \frac{\pi}{2^N + 1} + \sec^2 \frac{2\pi}{2^N + 1} + \dots + \sec^2 \frac{2^{N-1} \pi}{2^N + 1}}{\sec^2 \frac{2^{N-1} \pi}{2^N + 1} + \dots + \sec^2 \frac{\pi}{2^N + 1}} = 1$$

2. Let A is a matrix of order 3 such that  $|A| = -4$  then, the value of  $|\operatorname{adj}(\operatorname{adj}(2\operatorname{adj}A)^{-1})|$  is

- (1)  $\frac{1}{2^{26}}$  (2)  $\frac{1}{2^{27}}$   
(3)  $\frac{1}{2^{28}}$  (4)  $\frac{1}{2^{29}}$

Ans. (3)

Sol.  $|\operatorname{adj}(\operatorname{adj}(2\operatorname{adj}A)^{-1})|$   
 $= |(2\operatorname{adj}A)^{-1}|^4$   
 $= \frac{1}{|2\operatorname{adj}A|^4} = \frac{1}{(2^3)^4 |\operatorname{adj}A|^4}$   
 $= \frac{1}{2^{12} (-4)^8} = \frac{1}{2^{28}}$

3. If  $A = \frac{\sin 3^\circ}{\cos 9^\circ} + \frac{\sin 9^\circ}{\cos 27^\circ} + \frac{\sin 27^\circ}{\cos 81^\circ}$  and

$B = \tan 81^\circ - \tan 3^\circ$ , find  $\frac{B}{A}$

(1) 2 (2) 4  
(3) 6 (4) 8

Ans. (1)

Sol. Consider  $E = \frac{\sin \theta}{\cos 3\theta} \Rightarrow E = \frac{2 \sin \theta \cos \theta}{2 \cos 3\theta \cos \theta}$

$\Rightarrow E = \frac{\sin 2\theta}{2 \cos 3\theta \cos \theta} \Rightarrow E = \frac{\sin(3\theta - \theta)}{2 \cos 3\theta \cos \theta}$

$\Rightarrow E = \frac{1}{2} [\tan 3\theta - \tan \theta]$

$\therefore A = \frac{1}{2} [\tan 9^\circ - \tan 3^\circ + \tan 27^\circ - \tan 9^\circ + \tan 81^\circ - \tan 27^\circ]$

$\therefore A = \frac{1}{2} [\tan 81^\circ - \tan 3^\circ]$

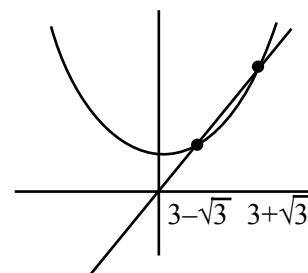
$\therefore \frac{B}{A} = 2$

4. If  $f(x) = \min \{2x^2 + 3, 6x\} + |x - 1| \cos \left(x^2 - \frac{1}{4}\right)$  then the number of points of non derivability of  $f(x)$  is/are

- (1) 1 (2) 2  
(3) 3 (4) 4

Ans. (3)

Sol.  $|x - 1| \cos \left(x^2 - \frac{1}{4}\right)$  is non derivable at  $x = 1$



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8. If  $Z$  be a complex number such that  $|Z + 2| = |Z - 2|$  and  $\arg\left(\frac{Z-3}{Z+1}\right) = \frac{\pi}{4}$  then the value of  $|Z|^2$  is :

(1) 7 (2) 8  
(3) 9 (4) 10

Ans. (3)

Sol.  $|Z + 2| = |Z - 2|$   
 $\Rightarrow x = 0$   
 $\arg\frac{Z-3}{Z+1} = \frac{\pi}{4}$   
 $\arg\frac{(x+iy)-3}{(x+iy)+1} = \frac{\pi}{4}$   
 $x = 0$   
 $\arg\frac{(-3+iy)(1-iy)}{1+y^2} = \frac{\pi}{4}$   
 $\Rightarrow \frac{-3+y^2}{y+3} = 1$   
 $y^2 - y - 6 = 0$   
 $y = 3, -2$   
 $Z = 3i, -2i$   
 $\Rightarrow |Z|^2 = 9 \text{ or } 4$

9. If coefficient of  $x^3$  in  $(1+x)^3 + (1+x)^4 + \dots + (1+x)^{99} + (1+kx)^{100}$  is  $\binom{100}{3}\left(\frac{101}{4} - 43n\right)$  then the value of  $(k^3 + 43n)$  is :

(1) 1 (2) 2  
(3) 3 (4) 4

Ans. (1)

Sol.  ${}^3C_3 + {}^4C_3 + {}^5C_3 + \dots + {}^{99}C_3 + {}^{100}C_3 k^3$   
 $= {}^{100}C_3 \left(\frac{101}{4} - 43n\right)$   
 ${}^{100}C_4 + {}^{100}C_3 k^3 = {}^{100}C_3 \left(\frac{101}{4} - 43n\right)$   
 ${}^{100}C_4 + {}^{100}C_3 k^3 = {}^{101}C_4 - {}^{100}C_3 \cdot 43n$   
 ${}^{100}C_3 (43n + k^3) = {}^{101}C_4 - {}^{100}C_4$   
 ${}^{100}C_3 (43n + k^3) = {}^{100}C_3$   
 $k^3 + 43n = 1$

10. If  $S = \{A : A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}, A^2 - 4A + 3I = \text{Null matrix}, a, b, c, d, \in \{0, 1, 2, 3, 4\} \text{ \& } \text{Tr}(A) = 4\}$  Then the number of element of set  $S$  is/are :

(1) 19 (2) 18  
(3) 17 (4) 15

Ans. (1)

Sol.  $ad - bc = 3 ; a + d = 4$   
 [C-1]  $a = 0, d = 4 ; bc = -3$  Not possible  
 [C-2]  $a = 1, d = 3 ; bc = 0$   
 $\downarrow$   
 No. of matrix =  $2 \times (5^2 - 4^2)$   
 [C-3]  $a = 2, ; bc = 1$   
 $\downarrow$   
 No. of matrix = 1  
 Total =  $2 \times 9 + 1 = 19$

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14. Let  $A = \{1, 2, 3, 4, 5\}$  and  $B = \{a, b, c\}$  then total number of functions from A to B which are not onto are

- (1) 84 (2) 93  
(3) 100 (4) 54

Ans. (2)

Sol. Total into function =  $3 \times 2^5 - 3$

15. Find number of ways of arranging 4 Boys & 3 Girls such that all girls are not together :

- (1) 4430 (2) 4445  
(3) 4320 (4) 4431

Ans. (3)

Sol. 4B, 3G

Total – when all girls are together

$$\square - \underline{5} \times \underline{3}$$

$$7 \times 6 \underline{5} - \underline{5} \times \underline{3}$$

$$6 \times \underline{5} \times 6 = 36 \times 120 = 4320$$

16. If Latus rectum of parabola  $y^2 = 4kx$  and ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$
 coincide then the value of  $e^2 + 2\sqrt{2}$  is,

where e is eccentricity of ellipse

- (1) 2 (2) 3  
(3) 4 (4) 3/2

Ans. (2)

Sol. LR  $x = ae$  &  $x = k$

$$k = ae \quad \frac{b^2}{a} = 2k$$

$$b^2 = 2a^2e$$

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

$$e^2 = 1 - \frac{b^2}{a^2} = 1 - 2e$$

$$e^2 + 2e - 1 = 0$$

$$e = \sqrt{2} - 1$$

$$e^2 = 3 - 2\sqrt{2}$$

$$e^2 + 2\sqrt{2} = 3$$

17. If  $L_1 : x - y = 0$ ,  $L_2 : y = -3x$ ,  $L_3$  is obtuse angle bisector of  $L_1$  &  $L_2$  and  $L_4$  is  $x + 3 = 0$ .

A is point of intersection of  $L_4$  &  $L_1$

B is point of intersection of  $L_4$  &  $L_2$

C is point of intersection of  $L_4$  &  $L_3$

Then the value of  $\frac{(BC)^2}{(AC)^2}$

- (1) 4 (2) 5  
(3) 6 (4) 7

Ans. (2)

Sol.  $L_3 : \frac{x-y}{\sqrt{2}} = \frac{y+3x}{\sqrt{10}}$

$$\Rightarrow L_3 : x - y = \frac{y + 3x}{\sqrt{5}}$$

Pt. A (-3, -3)

B (-3, 9)

$$C \left( -3, \frac{3(3 - \sqrt{5})}{1 + \sqrt{5}} \right)$$

$$BC = \left| \frac{9 - 3\sqrt{5} - 9 - 9\sqrt{5}}{1 + \sqrt{5}} \right| = \frac{12\sqrt{5}}{1 + \sqrt{5}}$$

$$AC = \left| \frac{9 - 3\sqrt{5} + 3 + 3\sqrt{5}}{1 + \sqrt{5}} \right| = \frac{12}{1 + \sqrt{5}}$$

$$\frac{BC}{AC} = \sqrt{5}$$

$$\Rightarrow \frac{BC^2}{AC^2} = 5$$

18. In an A.P. first term is  $\frac{10}{3}$  and first 30 terms are non-negative such that sum of first 30 terms =  $(T_{30})^3$ , then d is equal to

(where  $T_n$  is  $n^{\text{th}}$  term of A.P., and d is the common difference of A.P.)

- (1)  $\frac{3}{87}$  (2)  $\frac{5}{87}$   
(3)  $\frac{7}{87}$  (4)  $\frac{9}{87}$

Ans. (2)



Sol.  $a = \frac{10}{3} : S_{30} = (T_{30})^3$

$$\frac{30}{2} \left[ 2 \times \frac{10}{3} + 29d \right] = \left[ \frac{10}{3} + 29d \right]^3$$

$$15 \left( \frac{20}{3} + 29d \right) = \left( \frac{10}{3} + 29d \right)^3$$

$$15 \left( \frac{10}{3} + \frac{10}{3} + 29d \right) = \left( \frac{10}{3} + 29d \right)^3$$

By observation  $\frac{10}{3} + 29d = 5$

$$29d = 5 - \frac{10}{3} = \frac{5}{3}$$

$$d = \frac{5}{87}$$

19. If  $f(x)$  is a non-constant polynomial satisfying  $f(x) = f'(x)f''(x)$  and  $f(0) = 0$ .

Then the value of  $\int_0^2 f(x)dx + f'(2) + f''(2)$  is :

(1)  $\frac{14}{9}$

(2)  $\frac{14}{11}$

(3)  $\frac{11}{14}$

(4)  $\frac{9}{14}$

Ans. (1)

Sol.  $n = n - 1 + n - 2 \Rightarrow n = 3$

$$f(x) = ax^3 + bx^2 + cx$$

$$f(x) = f'(x) f''(x)$$

$$(ax^3 + bx^2 + cx) = (3ax^2 + 2bx + c) (6ax + 2b)$$

$$x^3 : a = 18a^2 \Rightarrow a = \frac{1}{18}$$

$$x^2 : b = 6ab + 12ab$$

$$x : c = 4b^2 + 6ac \Rightarrow \frac{2c}{3} = 4b^2 \Rightarrow b^2 = \frac{c}{6}$$

const :  $bc = 0 \Rightarrow b = c = 0$

$$\int_0^2 f(x)dx + f'(2) + f''(2)$$

$$\int_0^2 ax^3 dx + 12a + 12a = 4a + 24a = 28a = \frac{28}{18} = \frac{14}{9}$$

20. Let in a  $\Delta ABC$ , given that  $A \equiv (1,2)$ , mid-point of  $AB$  is  $(-5, -1)$  and centroid is  $(3,4)$  then circumcentre is  $(\alpha, \beta)$ , then the value of  $21(\alpha + \beta)$  is :

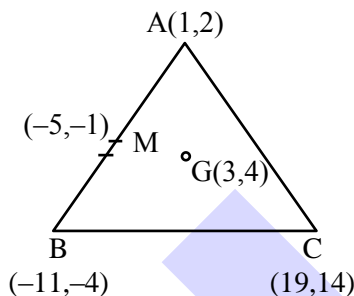
(1) 305

(2) 315

(3) 351

(4) 350

Ans. (2)



Sol.

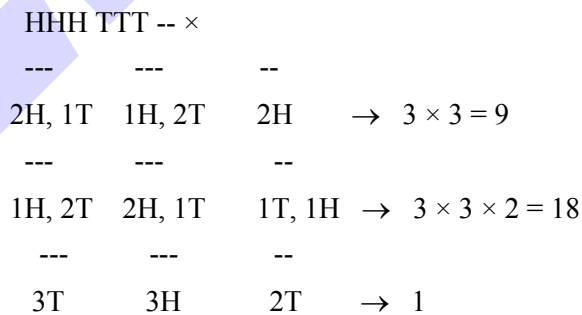
Now we can find the circumcenter of  $\Delta ABC$  as  $(-26, 41)$

$$\therefore \text{Value of } 21(-26 + 41) = 315$$

21. If a coin is tossed 8 times and probability of getting exactly 3 heads in first 6 tosses and exactly 2 tails in last 5 tosses is  $p$  then  $64p$  is

Ans. (7)

Sol.



$$\text{Now, } p = \frac{28}{2^8} = \frac{7}{64}$$

$$\therefore 64p = 7$$



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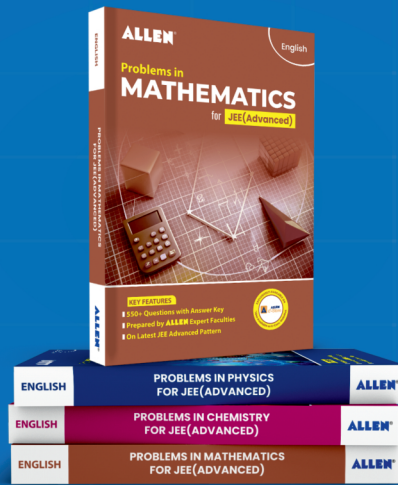
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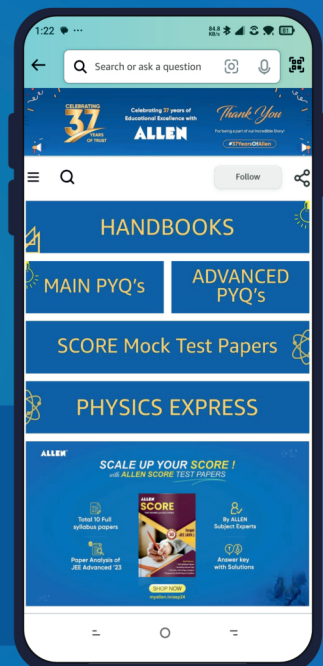
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