हमारा विश्वास...
हर एक विद्यार्थी है ख़ास

PAPER WITH ANSWER

JEE Advanced 2019

MATHEMATICS PAPER - 1

IIT/NIT | NEET/AIIMS | NTSE/IJSO/OLYMPIADS

कोटा का रिपिटर्स (12th पास) का सर्वश्रेष्ठ रिजल्ट देने वाला संस्थान

JEE ADVANCED 2018 RESULT

AIR 82
Sarthak Behera

AIR 120
Pankaj

AIR 146
Varun Goyal

AIR 148
Mukul Kumar

Total Selection
709/2084 = 34.02%

JEE MAIN 2019 RESULT

AIR 79
Shiv Kumar Modi

AIR 85
Anuj Chaudhary

AIR 96
Shubham Kumar

AIR 120
Eeshaan Jain

Students Qualified for JEE ADVANCED
2288/3316 = 68.99%

MOTION™
Nurturing potential through education

Toll Free : 1800-212-1799
H.O. : 394, Rajeev Gandhi Nagar, Kota
www.motion.ac.in | ✉: info@motion.ac.in

हमारा विश्वास... हर एक विद्यार्थी है ख़ास

MOTION™
Nurturing potential through education

CRITERIA FOR DIRECT ADMISSION IN STAR BATCHES

V STAR BATCH
XII Pass (JEE M+A)

ELIGIBILITY

JEE Main'19 %tile > 98%tile

JEE Advanced'19 Rank (Gen.) < 15,000

J STAR BATCH
XII Pass (NEET/AIIMS)

ELIGIBILITY

NEET'19 Score > 450 Marks

AIIMS'19 %tile > 98%tile

P STAR BATCH
XI Moving (JEE M+A)

ELIGIBILITY

NTSE Stage-1 Qualified or NTSE Score > 160

100 marks in Science or Maths in Board Exam

H STAR BATCH
XI Moving (NEET/AIIMS)

ELIGIBILITY

NTSE Stage-1 Qualified or NTSE Score > 160

100 marks in Science or Maths in Board Exam

Scholarship Criteria

JEE Main Percentile	SCHOLARSHIP+ STIPEND
98 - 99	100%
Above 99	100% + ₹ 5000/ month

JEE Advanced Rank	SCHOLARSHIP+ STIPEND
10000-20000	100%
Under 10000	100% + ₹ 5000/ month

NEET 2019 Marks	SCHOLARSHIP+ STIPEND
450	100%
530-550	100% + ₹ 2000/ month
550-560	100% + ₹ 4000/month
560	100% + ₹ 5000/month

NTSE STAGE-1 2019 Marks	SCHOLARSHIP+ STIPEND
160-170	100% + ₹ 2000/ month
171-180	100% + ₹ 4000/month
180+	100% + ₹ 5000/month

FEATURES :

- Batch will be taught by NV Sir & HOD's Only.
- Weekly Quizes apart from regular test.
- Under direct guidance of NV Sir.
- Residential campus facility available.
- 20 CBT (Computer Based Test) for better practice.
- Permanent academic coordinator for personal academic requirement.
- Small batch with only selected student.
- All the top brands material will be discussed.

SECTION -1 (Maximum Marks : 12)

- This section contains **FOUR (04)** questions.
- Each question has **FOUR** options **ONLY ONE** of these four options is correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme.

Full Marks : +3 If ONLY the correct option is chosen.
Zero Marks : 0 If none of the options is choosen (i.e. the question is unanswered)
Negative marks : –1 In all other cases

1. A line $y = mx + 1$ intersects the circle $(x - 3)^2 + (y + 2)^2 = 25$ at the points P and Q. If the midpoint of the line segment PQ has x - coordinate $\frac{-3}{5}$, then which one of the following options is correct ?

(1) $-3 \le mv < -1$ (2) $6 \le m < 8$ (3) $4 \le m < 6$ (4) $2 \le m < 4$

Sol. **4**

2. Let $M = \begin{bmatrix} \sin^4\theta & -1-\sin^2\theta \\ 1+\cos^2\theta & \cos^4\theta \end{bmatrix} = \alpha I + \beta M^{-1}$

where $\alpha = \alpha(\theta)$ and $\beta = \beta(\theta)$ are real numbers, and I is the 2×2 identity matrix. If
α^* is the minimum of set $\{\alpha(\theta): \theta \in [0,2\pi)\}$ and
β^* is the minimum of the set $\{\beta(\theta): \theta \in [0,2\pi)\}$
then the value of $\alpha^* + \beta^*$ is

(1) $\frac{-29}{16}$ (2) $-\frac{37}{16}$ (3) $-\frac{17}{16}$ (4) $-\frac{31}{16}$

Sol. **1**

3. let S be the set of all complex numbers z satsfying $|z - 2 + i| \ge \sqrt{5}$. If the complex number z_0 is such that $\frac{1}{|z_0 - 1|}$ is the maximum of the set $\left\{\frac{1}{|z-1|} : z \in S\right\}$, then the principal argument of $\frac{4 - z_0 - \bar{z}_0}{z_0 - \bar{z}_0 + 2i}$ is

(1) $\frac{\pi}{2}$ (2) $\frac{3\pi}{4}$ (3) $\frac{\pi}{4}$ (4) $-\frac{\pi}{2}$

Sol. **4**

4. The area of region $\{(x,y) : xy \le 8, 1 \le y \le x^2\}$ is

(1) $16\log_e 2 - \frac{14}{3}$ (2) $8\log_e 2 - \frac{7}{3}$ (3) $8\log_e 2 - \frac{14}{3}$ (4) $16\log_e 2 - 6$

Sol. **1**

SECTION -2 (Maximum Marks : 12)

- This section contains **EIGHT (08)** questions.
- Each question has **FOUR** options ONE OR MORE THAN ONE of these four option(s) is (are) correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme.
  Full marks : +4 If only (all) the correct option(s) is (are) chosen;
  Partial Marks : +3 If all the four options are correct but ONLY three options are chosen and both of which are correct
  Partial Marks : +1 If two or more options are correct but ONLY one option is chosen and it is a correct option.
  Zero Marks : 0 If two or more options is chosen (i.e. the question is unanswered)
  Negative Marks : –1 in all other cases
- For example, in a question, if (A),(B) and (D) are the ONLY three options corresponding to correct answer, then
  choosing ONLY (A), (B) and (D) will get +4 marks
  choosing ONLY (A) and (B) will get +2 marks
  choosing ONLY (A) and (D) will get +2 marks
  choosing ONLY (B) and (D) will get +2 marks
  choosing ONLY (A) will get +1 mark
  choosing ONLY (B) will get +1 mark
  choosing ONLY (D) will get +1 mark
  choosing no option (i.e., the question is unanswered) will get 0 marks; and
  choosing any other combination of options will get –1 mark

1. Let Γ denotes a curve y = y(x) which is in the first quadrant and let the point (1,0) lie on it. Let the tangent to Γ at a point P intersect the y - axis at Y_P. If PY_P has length 1 for each point P on Γ, then Which of the following options is/are correct ?

(1) $xy' - \sqrt{1-x^2} = 0$

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

(3) $xy' + \sqrt{1-x^2} = 0$

(4) $y = \log_e\left(\frac{1+\sqrt{1-x^2}}{x}\right) - \sqrt{1-x^2}$

Sol. **1,2,3,4**

2. Define the collections $\{E_1, E_2, E_3 .....\}$ of ellipse and $\{R_1, R_2, R_3 .....\}$ of rectangles as follows :

$E_1 : \frac{x^2}{9} + \frac{y^2}{4} = 1$;

R_1 : rectangle of largest area, with sides parallel to the axes, inscribed in E_1;

E_n : ellipse $\frac{x^2}{a_n^2} + \frac{y^2}{b_n^2} = 1$ of largest area inscribed in R_{n-1}, n > 1;

R_n : rectangle of largest area, with sides parallel to the axes, inscribed in E_n , n > 1
Then which of the following options is/are correct?
(1)The eccentricities of E_{18} and E_{19} are NOT equal

(2) The distance of a focus from the centre in E_9 is $\frac{\sqrt{5}}{32}$

(3) $\sum_{n=1}^{N}(\text{area of } R_n) < 24$, for each positive integer N

(4) The length of latus rectum of E_9 is $\frac{1}{6}$

Sol. **3,4**

3. Let $M = \begin{bmatrix} 0 & 1 & a \\ 1 & 2 & 3 \\ 3 & b & 1 \end{bmatrix}$ and adj $M = \begin{bmatrix} -1 & 1 & -1 \\ 8 & -6 & 2 \\ -5 & 3 & -1 \end{bmatrix}$ where a and b are real numbers. Which of the following options is/are correct ?

(1) det (adjM^2) = 81 (2) a + b = 3

(3) $(\text{adj } M)^{-1} + \text{adj } M^{-1} = -M$ (4) if $M\begin{bmatrix} \alpha \\ \beta \\ \gamma \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$, then $\alpha - \beta + \gamma = 3$

Sol. **2,3,4**

4. Let α and β be the roots of $x^2 - x - 1 = 0$, with $\alpha > \beta$. For all positive integer n, define

$a_n = \frac{\alpha^n - \beta^n}{\alpha - \beta}$, $n \geq 1$

$b_1 = 1$ and $b_n = a_{n-1} + a_{n+1}$, $n \geq 2$

Then which of the following options is/are correct ?

(1) $a_1 + a_2 + a_3 + ... + a_n = a_{n+2} - 1$ for all $n \geq 1$

(2) $b_n = \alpha^n + \beta^n$ for all $n \geq 1$

(3) $\sum_{n=1}^{\infty}\frac{b_n}{10^n} = \frac{8}{89}$ (4) $\sum_{n=1}^{\infty}\frac{a_n}{10^n} = \frac{10}{89}$

Sol. **1,2,4**

5. Let $f : R \to R$ be given by

$$f(x) = \begin{cases} x^5 + 5x^4 + 10x^3 + 10x^2 + 3x + 1, & x < 0 \\ x^2 - x + 1, & 0 \leq x < 1; \\ \frac{2}{3}x^3 - 4x^2 + 7x - \frac{8}{3}, & 1 \leq x < 3 \\ (x-2)\log_e(x-2) - x + \frac{10}{3}, & x \geq 3 \end{cases}$$

Then which of the following options is /are correct ?

(1) f is increasing on $(-\infty, 0)$ (2) f is onto

(3) f' has a local maximum at x = 1 (4) f' is NOT differentiable at x = 1

Sol. **2,3,4**

6. There are three bags B_1, B_2 and B_3. The bag B_1 contains 5 red and 5 green balls, B_2 contains 3 red and 5 green balls, and B_3 contains 5 red and 3 green balls. Bags B_1, B_2 and B_3 have probabilities $\frac{3}{10}$, $\frac{3}{10}$ and $\frac{4}{10}$ respectively of being chosen. A bag is selected at random and a ball is chosen at random from the bag. Then which of the following options is/are correct ?

(1) Probability that the chosen ball is green, given that the selected bag is B_3, equals $\frac{3}{8}$

(2) Probability that the selected bag is B_3 and the chosen ball is green equals $\frac{3}{10}$

(3) Probability that the selected bag is B_3, given that chosen ball is green, equals $\frac{5}{13}$

(4) Probability that the chosen ball is green equals $\frac{39}{80}$

Sol. **1,4**

7. In a non-right angled triangle ΔPQR, let p,q,r denote the lengths of the sides opposite to the angles at P,Q,R respectively. The median from R meets the side PQ at S, the perpendicular from P meets the side QR at E, and RS and PE intersect at O. If $p = \sqrt{3}$, q=1, and the radius of the circumcircle of the ΔPQR equals 1, then which of the following options is/are correct?

(1) Length of RS = $\frac{\sqrt{7}}{2}$ (2) Length of OE = $\frac{1}{6}$

(3) Radius of incircle ΔPQR = $\frac{\sqrt{3}}{2}\left(2-\sqrt{3}\right)$ (4) Area of ΔSOE= $\frac{\sqrt{3}}{12}$

Sol. **1,2,3**

8. Let L_1 and L_2 denote the lines

$$\vec{r} = \hat{i} + \lambda(-\hat{i} + +2\hat{j} + 2\hat{k}), \lambda \in R \text{ and}$$

$$\vec{r} = \mu(2\hat{i} - \hat{j} + 2\hat{k}), \mu \in R$$

respectively, If L_3 is a line which is perpendicular to both L_1 and L_2 and cuts both of them, then which of the following options describe(s) L_3?

(1) $\vec{r} = \frac{2}{9}(2\hat{i} - \hat{j} + 2\hat{k}) + t(2\hat{i} + 2\hat{j} - \hat{k})$, $t \in R$ (2) $\vec{r} = \frac{2}{9}(4\hat{i} + \hat{j} + \hat{k}) + t(2\hat{i} + 2\hat{j} - \hat{k})$, $t \in R$

(3) $\vec{r} = \frac{1}{3}(2\hat{i} + \hat{k}) + t(2\hat{i} + 2\hat{j} - \hat{k})$, $t \in R$ (4) $\vec{r} = t(2\hat{i} + 2\hat{j} - \hat{k})$ $t \in R$

Sol. **1,2**

Section - 3

- This section contains SIX (06) qeustions. The answer to each question is a NUMERICAL VALUE.
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. If the numerical value has more than two decimal places, truncate/roundoff the value to TWO decimal places.
- Answer to each question will be evaluated according to the following marking scheme;
  Full Marks : +3 If ONLY the correct numerical value is entered
  Zero Marks : 0 in all other cases.

1. Three lines are given by

$\vec{r} = \lambda\hat{i}, \lambda \in R$

$\vec{r} = \mu(\hat{i} + \hat{j}), \mu \in R$

$\vec{r} = v(\hat{i} + \hat{j} + \hat{k}), v \in R$

Let the lines cut the plane x + y + z = 1 at the points A, B and C respectively. If the area of the triangle ABC is Δ then value of $(6\Delta)^2$ equals _____.

Sol. **0.75**

2. Let S be the sample space of all 3 × 3 matrices with entries from the set {0,1}, Let the events E_1 and E_2 be given by

E_1 = {A ∈ S : det A = 0} and

E_2 = {A ∈ S : sum of entries of A is 7}

If a matrix is chosen at random from S, then the conditional probability $P(E_1|E_2)$ equals

Sol. **0.5**

3. Let$\omega \neq 1$ be a cube root of unit. Then the minimum of the set

$\{|a + b\omega = c\omega^2|^2 : a, b, c$ distinct non-zero integers$\}$ equals _____.

Sol. **3**

4. Let AP(a; d) denote the set of all the terms of an infinite arithmetic progression with first term α and common difference d > 0, If

$AP(1;3) \cap AP(2;5) \cap AP(3;7) = AP(a;d)$ then a + d equals _____.

Sol. **157**

5. If $I = \frac{2}{\pi}\int_{-\pi/4}^{\pi/4} \frac{dx}{(1+e^{\sin x})(2-\cos 2x)}$ then $27I^2$ equals _____.

Sol. **4**

6. Let the point B be the relfection of the point A(2,3) with respect to the line 8x – 6y – 23 = 0. Let Γ_A and Γ_B be circles of radii 2 and 1 with centres A and B resepectively.Let T be a common tangent to the circles Γ_A and Γ_B such that both the circles are on the same side of T. If C is the point of intersection of T and the line passing through A and B, then the length of the line segment AC is _____.

Sol. **10**

हमारा विश्वास... हर एक विद्यार्थी है ख़ास

MOTION™
Nurturing potential through education

Based on JEE Advanced'19

MARKS	FEE (After Scholarship)
140 above	Drona Residential Program Free
120 to 139	₹ 0
100 to 120	₹ 14,500
90 to 99	₹ 29,000
80 to 89	₹ 43,500
69 to 79	₹ 58,000
40 to 69	₹ 87,000

*Scholarship Applicable at Kota Center Only

Based on JEE Main'19

JEE Main Percentile	English	Hindi
	Fees (After Scholarship)	
99 & Above	Drona Residential Program Free	
97.5 To 99	₹ 0	₹ 0
97 To 97.5	₹ 14,500	₹ 14,500
96.5 To 97	₹ 29,000	₹ 29,000
96 To 96.5	₹ 58,000	₹ 58,000
95.5 To 96	₹ 65,250	₹ 65,250
95 To 95.5	₹ 72,500	₹ 72,500
93 To 95	₹ 87,000	₹ 87,000
90 To 93	₹ 1,01,500	₹ 94,250
85 To 90	₹ 1,08,750	₹ 1,01,500
80 To 85	₹ 1,16,000	₹ 1,08,750
75 To 80	₹ 1,30,500	₹ 1,23,250

JEE MAIN Special Batch
for Class 14th Repeaters

Flat 50% Scholarship

(Fee after Scholarship) **Only ₹ 46,750**