

SAMPLE PAPER

2019 JEE ADVANCED

MATHEMATICS

SET-1

Roll No.

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Section 1 (Maximum Marks : 28)

- (i) This section contains **SEVEN** questions.
- (ii) Each question has **FOUR** options (a), (b), (c) and (d). **ONE OR MORE THAN ONE** of these four options is correct.
- (iii) For each question, darken the bubble corresponding to the correct option in the ORS.
- (iv) For each question, marks will be awarded in one of the following categories:
- Full Marks : +4 If only the bubble corresponding to the correct option is darkened.
- Partial Marks : +1 For darkening a bubble corresponding to **each correct option**, provided **NO** incorrect option is darkened.
- Zero Marks : 0 If none of the bubbles is darkened.
- Negative Marks : -2 In all other cases.
- (v) For example, if (a), (c) and (d) are all the correct options for a question, darkening all these three will result in +4 marks; darkening only (a) and (d) will result in +2 marks; and darkening (a) and (b) will result in -2 marks, as a wrong option is also darkened.

1. If z_1, z_2 are non-zero complex numbers such that

$$|z_1| = |z_2| = |z_1 + z_2| \text{ then } z_1/z_2 \text{ can be}$$

- (a) 1
(b) ω
(c) ω^2
(d) -1



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2. If $\lim_{x \rightarrow 0} \frac{a \sin x - bx + cx^2 + x^3}{2x^2 \log(1+x) - 2x^3 + x^4}$ exists and is finite, then
- $a = b$
 - $c = 0$
 - $a = b$
 - $c = 2$
3. For two events A and B , if $P(A) = P(A | B) = 1/4$ and $P(B | A) = 1/2$, then
- A and B are independent
 - A and B are mutually exclusive
 - $P(A' | B) = 3/4$
 - $P(B' | A') = 1/2$.
4. Let $F(x) = \int_0^x (t-1)(t-2)^2 dt$, then
- $(1, -17/12)$ is a point of minimum
 - $(2, -4/3)$ is a point of inflexion
 - $(4/3, -112/81)$ is a point of inflexion
 - $(1, -3)$ is a point of minimum
5. The equation of a tangent to the hyperbola $3x^2 - y^2 = 3$, parallel to the line $y = 2x + 4$ is
- $y = 2x + 3$
 - $y = 2x + 1$
 - $y = 2x - 1$
 - $y = 2x + 2$
6. Let f be a differentiable function with range $(0, \infty)$ and $g(x) = (f(x))^2 - (f(x))^3 + (f(x))^4$ for every $x \in \mathbf{R}$. Then
- g is increasing whenever f is increasing.
 - g is increasing whenever f is decreasing.
 - g is decreasing whenever f is decreasing.
 - critical point of g are same as of that of f .
7. If $I = \int \frac{\sqrt{1+\ln x}}{x \ln x} = a f(x) + \frac{b}{2} \ln \left| \frac{f(x)+c}{f(x)+d} \right| + k$ then
- $c + d = 0$
 - $a = b$
 - $f(x) = \sqrt{\ln x}$
 - $f(x) = \sqrt{\ln(ex)}$



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Section-2 (Maximum Marks : 15)

- (i) This section contains 5 question.
- (ii) The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive.
- (iii) For each question, darken the bubble corresponding to the correct integer in the OMR.
- (iv) For each question, marks will be awarded in one of the following categories:
Full Marks : +3 If, only the bubble corresponding to the correct option is darkened.
Zero Marks : 0 In all other cases.

8. For $n > 2$, let $C_r = {}^nC_r$, and $f(n) = 3C_2 + 5C_4 + 7C_6 + \dots$, then $2^{-5} f(6)$ equals

9. Let

$$f(x) = \begin{vmatrix} 1 + \sin^2 x & \cos^2 x & 4 \sin 2x \\ \sin^2 x & 1 + \cos^2 x & 4 \sin 2x \\ \sin^2 x & \cos^2 x & 1 + 4 \sin 2x \end{vmatrix}$$

then the maximum value of $f(x)$

10. If the equation $12x^2 - 10xy + 2y^2 + 11x - 5y + \lambda = 0$ represents a pair of straight lines, then the value of $\lambda =$

11. Given the function $f(x) = \lim_{n \rightarrow \infty} n(x^{1/n} - 1)$, $x > 0$. Suppose f satisfies $7f(1/x) + kf(x) = 0$ then k is equal to

12. If the distance between the plane $Ax - 2y + z = d$ and the plane containing the lines

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} \text{ and } \frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5} \text{ is } \sqrt{6}, \text{ then } |d| \text{ is}$$

Section-3 (Maximum Marks : 18)

- (i) This section contains 2 paragraphs.
- (ii) Based on each paragraph, there are two questions.
- (iii) Each question has **FOUR** options (a), (b) (c) (d). **ONLY ONE** of these four options is correct.
- (iv) For each question, darken the bubble corresponding to the correct option in the ORS.
- (v) For each question, marks will be awarded in one of the following categories:
Full Marks : +3 If, only the bubble corresponding to the correct option is darkened.
Zero Marks : 0 In all other cases.



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Paragraph for Question Nos. 13 to 15

$$f(x) = \sin \{ \cot^{-1} (x + 1) \} - \cos (\tan^{-1} x)$$

$$a = \cos \tan^{-1} \sin \cot^{-1} x$$

$$b = \cos (2 \cos^{-1} x + \sin^{-1} x)$$

13. The value of x for which $f(x) = 0$ is

- (a) $-1/2$
- (b) 0
- (c) $1/2$
- (d) 1

14. If $f(x) = 0$ then a^2 is equal to

- (a) $1/2$
- (b) $2/3$
- (c) $5/9$
- (d) $9/5$

15. If $a^2 = 26/51$, then b^2 is equal to

- (a) $1/25$
- (b) $24/25$
- (c) $25/26$
- (d) $50/51$

Paragraph for Question Nos. 16 to 18

Given a sequence t_1, t_2, \dots if its possible to find a function $f(r)$ such that

$$t_r = f(r + 1) - f(r)$$

then

$$\sum_{r=1}^n t_r = f(n + 1) - f(1)$$

16. Sum of the series $\sum_{r=1}^{\infty} \frac{1}{4r^2 - 1}$ is

- (a) 2
- (b) 1
- (c) $1/2$
- (d) $1/4$

17. If $u_1 = 1$, $u_{n+1} = 2u_n + 1$, then u_{n+1} equals

- (a) $2^n + 1$
- (b) $2^{n+1} - 1$
- (c) $2^n - 2$
- (d) $2^{n+1} - 2$



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18. Sum of the $\sum_{r=1}^{\infty} \frac{1}{r(r+1)(r+2)}$ is

- (a) 1
- (b) $1/2$
- (c) $1/4$
- (d) $1/8$



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