Space for rough work

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CANDIDATE ANSWER BOOKLET JEE

CANDIDATE DETAILS

NAME OF STUDENT

DATE OF EXAMINATION __ / __ / ____

CLASS

BOARD

TIME DURATION __ : __ To __ : __

Read The Instructions Carefully

- Please read these instructions carefully. A candidate who breaches any of the Examination Regulations will be liable to disciplinary action
- Examinations will be conducted during the allocated times shown in the examination timetable.
- Do NOT turn over the question paper until instructed at the time of commencement of the examination.
- Any unauthorised materials or devices found in your possession after the start of the examination will be confiscated, and you will be liable to disciplinary action.
- Handphones brought into the examination hall must be switched off at ALL times. If your handphone is found to be switched on in the examination hall, the handphone will be confiscated and retained for investigation of possible violation of regulations.
- Please check that you have the correct question paper and read the instructions printed on your examination question paper carefully.
- You are not allowed to communicate by word of mouth or otherwise with other candidates (this includes the time when answer scripts are being collected).
- Please raise your hand if you wish to communicate with an invigilator.
- Unless granted permission by an invigilator, you are not allowed to leave your seat.
- Once you have entered the examination hall, you will not be allowed to leave the hall until one hour after the examination has commenced.

Question Paper Format

- Each question carries 4 marks.
- For correct answer, +4 marks. For wrong answer, -1 marks. For no attempt, 0 marks.
- All questions are compulsory.
- The question paper contains 25 objective type questions.
- Total time duration of the examination is 60 minutes.

Score Card

+4

0

-1

Total Score

Pass Score

Result

Pass/Fail

1. If the coefficients of x^3 and x^4 in the expansion of $(1+ax+bx^2)(1-2x)^{18}$ in powers of x are both zero, then (a, b) is equal to :

(1) $\left(14, \frac{272}{3}\right)$

(2) $\left(16, \frac{272}{3}\right)$

(3) $\left(16, \frac{251}{3}\right)$

(4) $\left(14, \frac{251}{3}\right)$

2. If $(10)^9+2(11)^1(10)^8+3(11)^2(10)^7+\ldots+10(11)^9=k(10)^9$, then k is equal to :

(1) 100

(2) 110

(3) $\frac{121}{10}$

(4) $\frac{441}{100}$

3. Three positive numbers form an increasing G.P. If the middle term in this G.P. is doubled, the new numbers are in A.P. Then the common ratio of the G.P. is :

(1) $2-\sqrt{3}$

(2) $2+\sqrt{3}$

(3) $\sqrt{2}+\sqrt{3}$

(4) $3+\sqrt{2}$

4. $\lim\limits_{x\to 0} \frac{\sin(\pi \cos^2 x)}{x^2}$ is equal to :

(1) $-\pi$

(2) π

(3) $\frac{\pi}{2}$

(4) 1

5. If f and g are differentiable functions in [0, 1] satisfying $f(0)=2=g(1)$, $g(0)=0$ and $f(1)=6$, then for some c∈]0, 1[:

(1) $f'(c)=g'(c)$

(2) $f'(c)=2g'(c)$

(3) $2f'(c)=g'(c)$

(4) $2f'(c)=3g'(c)$

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6. Let PS be the median of the triangle with vertices P(2, 2), Q(6, −1) and R(7, 3). The equation of the line passing through (1, −1) and parallel to PS is :

(1) $4x+7y+3=0$

(2) $2x-9y-11=0$

(3) $4x-7y-11=0$

(4) $2x+9y+7=0$

7. Let a, b, c and d be non-zero numbers. If the point of intersection of the lines $4ax+2ay+c=0$ and $5bx+2by+d=0$ lies in the fourth quadrant and is equidistant from the two axes then :

(1) $3bc-2ad=0$

(2) $3bc+2ad=0$

(3) $2bc-3ad=0$

(4) $2bc+3ad=0$

8. $\log_{10}2$, $\log_{10}(2^x-1)$ and $\log_{10}(2^x+3)$ are three consecutive terms of an A. P. for :

(1) no real x

(2) exactly one real x

(3) exactly two real x

(4) more than two real x.

9. A bird is sitting on the top of a vertical pole 20 m high and its elevation from a point O on the ground is 45°. It flies off horizontally straight away from the point O. After one second, the elevation of the bird from O is reduced to 30°. Then the speed (in m/s) of the bird is :

(1) $20\sqrt{2}$

(2) $20(\sqrt{3}-1)$

(3) $40(\sqrt{2}-1)$

(4) $40(\sqrt{3}-\sqrt{2})$

10. Let C be the circle with centre at (1, 1) and radius = 1. If T is the circle centred at (0, y), passing through origin and touching the circle C externally, then the radius of T is equal to :

(1) $\frac{1}{2}$

(2) $\frac{1}{4}$

(3) $\frac{\sqrt{3}}{\sqrt{2}}$

(4) $\frac{\sqrt{3}}{2}$

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11. The eccentricity of an ellipse whose centre is at the origin is $\frac{1}{2}$. If one of its directrices is $x=-4$, then the equation of the normal to it at $\left(1, \frac{3}{2}\right)$ is :

(1) $4x-2y=1$

(2) $4x+2y=7$

(3) $x+2y=4$

(4) $2y-x=2$

12. A hyperbola passes through the point $P(\sqrt{2}, \sqrt{3})$ and has foci at $(\pm 2, 0)$. Then the tangent to this hyperbola at P also passes through the point :

(1) $(2\sqrt{2}, 3\sqrt{3})$

(2) $(\sqrt{3}, \sqrt{2})$

(3) $(-\sqrt{2}, -\sqrt{3})$

(4) $(3\sqrt{2}, 2\sqrt{3})$

13. If $5(\tan^2 x-\cos^2 x)=2\cos 2x+9$, then the value of $\cos 4x$ is :

(1) $\frac{1}{3}$

(2) $\frac{2}{9}$

(3) $-\frac{7}{9}$

(4) $-\frac{3}{5}$

14. Let a vertical tower AB have its end A on the level ground. Let C be the mid-point of AB and P be a point on the ground such that $AP=2AB$. If $\angle BPC=\beta$, then $\tan\beta$ is equal to :

(1) $\frac{1}{4}$

(2) $\frac{2}{9}$

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

(4) $\frac{6}{7}$

15. A wire of length 2 units is cut into two parts which are bent respectively to form a square of side $=x$ units and a circle of radius $=r$ units. If the sum of the areas of the square and the circle so formed is minimum, then :

(1) $2x=(\pi+4)r$

(2) $(4-\pi)x=\pi r$

(3) $x=2r$

(4) $2x=r$

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16. If all the words (with or without meaning) having five letters, formed using the letters of the word SMALL and arranged as in a dictionary; then the position of the word SMALL is :

(1) 46^{th}

(2) 59^{th}

(3) 52^{nd}

(4) 58^{th}

17. If the 2^{nd}, 5^{th} and 9^{th} terms of a non-constant A.P. are in G.P., then the common ratio of this G.P. is :

(1) $\frac{8}{5}$

(2) $\frac{4}{3}$

(3) 1

(4) $\frac{7}{4}$

18. If the number of terms in the expansion of $\left(1-\frac{2}{x}+\frac{4}{x^2}\right)^n$, $x \neq 0$, is 28, then the sum of the coefficients of all the terms in this expansion, is :

(1) 64

(2) 2187

(3) 243

(4) 729

19. Consider

$$f(x)=\tan^{-1}\left(\sqrt{\frac{1+\sin x}{1-\sin x}}\right),\ x \in \left(0, \frac{\pi}{2}\right).$$

A normal to $y=f(x)$ at $x=\frac{\pi}{6}$ also passes through the point :

(1) (0, 0)

(2) $\left(0, \frac{2\pi}{3}\right)$

(3) $\left(\frac{\pi}{6}, 0\right)$

(4) $\left(\frac{\pi}{4}, 0\right)$

20. If the sum of the first ten terms of the series

$$\left(1\frac{3}{5}\right)^2+\left(2\frac{2}{5}\right)^2+\left(3\frac{1}{5}\right)^2+4^2+\left(4\frac{4}{5}\right)^2+\ldots\ldots,$$

is $\frac{16}{5}m$, then m is equal to :

(1) 102

(2) 101

(3) 100

(4) 99

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INTEGER TYPE QUESTIONS:

1. The sides of a right angled triangle are in arithmetic progression. If the triangle has area 24, then what is the length of its smallest side?

2. The value of

$$6+\log_{3/2}\left(\frac{1}{3\sqrt{2}}\sqrt{4-\frac{1}{3\sqrt{2}}\sqrt{4-\frac{1}{3\sqrt{2}}\sqrt{4-\frac{1}{3\sqrt{2}}\cdots}}}\right)$$ is

3. Let S be the focus of the parabola $y^2 = 8x$ and let PQ be the common chord of the circle $x^2 + y^2 - 2x - 4y = 0$ and the given parabola. The area of the triangle PQS is

36. If the roots of the equation $\frac{1}{x+p}+\frac{1}{x+q}=\frac{1}{r}$ are equal in magnitude and opposite in sign, then the product of roots is :

(1) $-\frac{1}{2}(p^2-q^2)$

(2) (p^2+q^2)

(3) $\frac{1}{2}(p^2+q^2)$

(4) $-\frac{1}{2}(p^2+q^2)$

37. Sum of the last 30 coefficients of powers of x in the binomial expansion of $(1+x)^{59}$ is :

(1) 2^{58}

(2) 2^{29}

(3) 2^{28}

(4) $2^{59}-2^{29}$

38. If α, $\beta \neq 0$, and $f(n)=\alpha^n+\beta^n$ and

$$\begin{vmatrix} 3 & 1+f(1) & 1+f(2) \\ 1+f(1) & 1+f(2) & 1+f(3) \\ 1+f(2) & 1+f(3) & 1+f(4) \end{vmatrix}$$

$=K(1-\alpha)^2\ (1-\beta)^2\ (\alpha-\beta)^2$, then K is equal to :

(1) 1

(2) -1

(3) $\alpha\beta$

(4) $\frac{1}{\alpha\beta}$

39. If z is a complex number of unit modulus and argument θ, then the real part of $\frac{z(1-\bar{z})}{\bar{z}(1+z)}$ is :

(1) $2\cos^2\frac{\theta}{2}$

(2) $1+\cos\frac{\theta}{2}$

(3) $1-\sin\frac{\theta}{2}$

(4) $-2\sin^2\frac{\theta}{2}$

40. Let α and β be the roots of equation $px^2+qx+r=0$, $p\neq 0$. If p, q, r are in A.P. and $\frac{1}{\alpha}+\frac{1}{\beta}=4$, then the value of $|\alpha-\beta|$ is :

(1) $\frac{\sqrt{34}}{9}$

(2) $\frac{2\sqrt{13}}{9}$

(3) $\frac{\sqrt{61}}{9}$

(4) $\frac{2\sqrt{17}}{9}$

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21. If a circle has two of its diameters along the lines $x+y=5$ and $x-y=1$ and has area 9π, then the equation of the circle is :

(1) $x^2+y^2-6x-4y+4=0$

(2) $x^2+y^2-6x-4y-3=0$

(3) $x^2+y^2-6x-4y-4=0$

(4) $x^2+y^2-6x-4y+3=0$

22. Let $f(x)=\begin{cases} \frac{1}{|x|} & if\ |x|>2 \\ a+bx^2 & if\ |x|\leq 2 \end{cases}$,

then $f(x)$ is differentiable at $x=-2$ for :

(1) $a=\frac{3}{4}$ and $b=\frac{1}{16}$

(2) $a=\frac{3}{4}$ and $b=-\frac{1}{16}$

(3) $a=-\frac{1}{4}$ and $b=\frac{1}{16}$

(4) $a=\frac{1}{4}$ and $b=-\frac{1}{16}$

23. $f(x)=|x\ \log_e x|$, $x>0$, is monotonically decreasing in :

(1) (e, ∞)

(2) $\left(0, \frac{1}{e}\right)$

(3) $\left[\frac{1}{e}, 1\right]$

(4) $(1, e)$

24. Let P be a point in the first quadrant lying on the ellipse $9x^2+16y^2=144$, such that the tangent at P to the ellipse is inclined at an angle 135° to the positive direction of x-axis. Then the coordinates of P are :

(1) $\left(\frac{16}{5}, \frac{9}{5}\right)$

(2) $\left(\frac{\sqrt{143}}{3}, \frac{1}{4}\right)$

(3) $\left(\frac{8}{9}, \frac{\sqrt{77}}{3}\right)$

(4) $\left(\frac{4}{\sqrt{2}}, \frac{3}{\sqrt{2}}\right)$

25. Suppose that six students, including Madhu and Puja, are having six beds arranged in a row. Further, suppose that Madhu does not want a bed adjacent to Puja. Then the number of ways, the beds can be allotted to students is :

(1) 384

(2) 264

(3) 480

(4) 600

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26. Let a, b, c $\in$ **R**. If $f(x) = ax^2 + bx + c$ is such that $a + b + c = 3$ and

$f(x+y) = f(x) + f(y) + xy,\ \forall\ x, y \in \mathbf{R}$,

then $\sum_{n=1}^{10} f(n)$ is equal to :

(1) 165

(2) 190

(3) 255

(4) 330

27. The normal to the curve $y(x-2)(x-3) = x+6$ at the point where the curve intersects the y-axis passes through the point :

(1) $\left(\frac{1}{2}, \frac{1}{2}\right)$

(2) $\left(\frac{1}{2}, -\frac{1}{3}\right)$

(3) $\left(\frac{1}{2}, \frac{1}{3}\right)$

(4) $\left(-\frac{1}{2}, -\frac{1}{2}\right)$

28. Twenty meters of wire is available for fencing off a flower-bed in the form of a circular sector. Then the maximum area (in sq. m) of the flower-bed, is :

(1) 10

(2) 25

(3) 30

(4) 12.5

29. If for $x \in \left(0, \frac{1}{4}\right)$, the derivative of $\tan^{-1}\left(\frac{6x\sqrt{x}}{1-9x^3}\right)$ is $\sqrt{x} \cdot g(x)$, then $g(x)$ equals :

(1) $\frac{3x\sqrt{x}}{1-9x^3}$

(2) $\frac{3x}{1-9x^3}$

(3) $\frac{3}{1+9x^3}$

(4) $\frac{9}{1+9x^3}$

30. Let k be an integer such that the triangle with vertices (k, −3k), (5, k) and (−k, 2) has area 28 sq. units. Then the orthocentre of this triangle is at the point :

(1) $\left(1, \frac{3}{4}\right)$

(2) $\left(1, -\frac{3}{4}\right)$

(3) $\left(2, \frac{1}{2}\right)$

(4) $\left(2, -\frac{1}{2}\right)$

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31. If, for a positive integer n, the quadratic equation,

$x(x+1) + (x+1)(x+2) + \ldots$

$+ (x + \overline{n-1})\ (x+n) = 10n$

has two consecutive integral solutions, then n is equal to :

(1) 9

(2) 10

(3) 11

(4) 12

32. Let ω be a complex number such that $2\omega + 1 = z$ where $z = \sqrt{-3}$. If

$$\begin{vmatrix} 1 & 1 & 1 \\ 1 & -\omega^2-1 & \omega^2 \\ 1 & \omega^2 & \omega^7 \end{vmatrix} = 3k,$$

then k is equal to :

(1) z

(2) -1

(3) 1

(4) $-z$

33. The value of

$\left({}^{21}C_1 - {}^{10}C_1\right) + \left({}^{21}C_2 - {}^{10}C_2\right) +$

$\left({}^{21}C_3 - {}^{10}C_3\right) + \left({}^{21}C_4 - {}^{10}C_4\right) + \ldots.. +$

$\left({}^{21}C_{10} - {}^{10}C_{10}\right)$ is :

(1) $2^{21} - 2^{10}$

(2) $2^{20} - 2^{9}$

(3) $2^{20} - 2^{10}$

(4) $2^{21} - 2^{11}$

34. If $A = \begin{bmatrix} 2 & -3 \\ -4 & 1 \end{bmatrix}$, then adj $(3A^2 + 12A)$ is equal to :

(1) $\begin{bmatrix} 51 & 63 \\ 84 & 72 \end{bmatrix}$

(2) $\begin{bmatrix} 51 & 84 \\ 63 & 72 \end{bmatrix}$

(3) $\begin{bmatrix} 72 & -63 \\ -84 & 51 \end{bmatrix}$

(4) $\begin{bmatrix} 72 & -84 \\ -63 & 51 \end{bmatrix}$

35. A man X has 7 friends, 4 of them are ladies and 3 are men. His wife Y also has 7 friends, 3 of them are ladies and 4 are men. Assume X and Y have no common friends. Then the total number of ways in which X and Y together can throw a party inviting 3 ladies and 3 men, so that 3 friends of each of X and Y are in this party, is :

(1) 468

(2) 469

(3) 484

(4) 485

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