COMMON ENTRANCE TEST-2016

DATE	SUBJECT	TIME
DAY-1	MATHEMATICS	02.30 P.M. TO 03.50 P.M.

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
60	80 MINUTES	70 MINUTES

MENTION YOUR CET NUMBER					QUESTION BOOKLET DETAILS	
					VERSION CODE	SERIAL NUMBER
					A - 1	381617

DOs :

1. Check whether the CET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. This Question Booklet is issued to you by the invigilator after the **2nd Bell i.e., after 2.30 p.m.**
3. The Serial Number of this question booklet should be entered on the OMR answer sheet.
4. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'Ts :

1. **THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.**
2. The **3rd Bell rings at 2.40 p.m., till then;**
   - Do not remove the paper seal present on the right hand side of this question booklet.
   - Do not look inside this question booklet.
   - Do not start answering on the OMR answer sheet.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 60 questions and each question will have one statement and four distracters. (Four different options / choices.)
2. After the **3rd Bell is rung at 2.40 p.m.,** remove the paper seal on the right hand side of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
3. During the subsequent 70 minutes:
   - Read each question carefully.
   - Choose the correct answer from out of the four available distracters (options / choices) given under each question / statement.
   - **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.**

Correct Method of shading the circle on the OMR answer sheet is as shown below :

4. Please note that even a minute unintended ink dot on the OMR answer sheet will also be recognized and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
5. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
6. After **the last bell is rung at 3.50 p.m.,** stop writing on the OMR answer sheet and affix your LEFT HAND THUMB IMPRESSION on the OMR answer sheet as per the instructions.
7. Hand over the **OMR ANSWER SHEET** to the room invigilator as it is.
8. After separating the top sheet (Our Copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
9. Preserve the replica of the OMR answer sheet for a minimum period of ONE year.

1. The Set A has 4 elements and the Set B has 5 elements then the number of injective mappings that can be defined from A to B is

(1) 144 (2) 72

(3) 60 (4) 120

2. Let $f : R \to R$ be defined by $f(x) = 2x + 6$ which is a bijective mapping then $f^{-1}(x)$ is given by

(1) $\frac{x}{2} - 3$ (2) $2x + 6$

(3) $x - 3$ (4) $6x + 2$

3. Let $*$ be a binary operation defined on R by $a * b = \frac{a+b}{4} \forall a, b \in R$ then the operation $*$ is

(1) Commutative and Associative

(2) Commutative but not Associative

(3) Associative but not Commutative

(4) Neither Associative nor Commutative

4. The value of $\sin^{-1}\left(\cos\frac{53\pi}{5}\right)$ is

(1) $\frac{3\pi}{5}$ (2) $\frac{-3\pi}{5}$

(3) $\frac{\pi}{10}$ (4) $\frac{-\pi}{10}$

Space For Rough Work

5. If $3\tan^{-1}x + \cot^{-1}x = \pi$ then x equal to

(1) 0 (2) 1

(3) -1 (4) 1/2

6. The simplified form of $\tan^{-1}\left(\frac{x}{y}\right) - \tan^{-1}\left(\frac{x-y}{x+y}\right)$ is equal to

(1) 0 (2) $\frac{\pi}{4}$

(3) $\frac{\pi}{2}$ (4) π

7. If x y z are all different and not equal to zero and $\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{vmatrix} = 0$

then the value of $x^{-1} + y^{-1} + z^{-1}$ is equal to

(1) xyz (2) $x^{-1}\, y^{-1}\, z^{-1}$

(3) $-x - y - z$ (4) -1

8. If A is any square matrix of order 3×3 then $|3A|$ is equal to

(1) $3|A|$ (2) $\frac{1}{3}|A|$

(3) $27|A|$ (4) $9|A|$

Space For Rough Work

9. If $y = e^{\sin^{-1}(t^2-1)}$ & $x = e^{\sec^{-1}\left(\frac{1}{t^2-1}\right)}$ then $\frac{dy}{dx}$ is equal to

(1) $\frac{x}{y}$ (2) $\frac{-y}{x}$

(3) $\frac{y}{x}$ (4) $\frac{-x}{y}$

10. If $A = \frac{1}{\pi}\begin{bmatrix} \sin^{-1}(\pi x) & \tan^{-1}(\frac{x}{\pi}) \\ \sin^{-1}(\frac{x}{\pi}) & \cot^{-1}(\pi x) \end{bmatrix}$, $B = \frac{1}{\pi}\begin{bmatrix} -\cos^{-1}(\pi x) & \tan^{-1}(\frac{x}{\pi}) \\ \sin^{-1}(\frac{x}{\pi}) & -\tan^{-1}(\pi x) \end{bmatrix}$ then A – B is equal to

(1) I (2) 0

(3) 2I (4) $\frac{1}{2}$I

11. If $x^y = e^{x-y}$ then $\frac{dy}{dx}$ is equal to

(1) $\frac{\log x}{\log(x-y)}$ (2) $\frac{e^x}{x^{x-y}}$

(3) $\frac{\log x}{(1+\log x)^2}$ (4) $\frac{1}{y} - \frac{1}{x-y}$

12. If A is a matrix of order m × n and B is a matrix such that AB' and B'A are both defined, the order of the matrix B is

(1) m × m (2) n × n

(3) n × m (4) m × n

Space For Rough Work

13. The value of $\int \frac{e^x(1+x)dx}{\cos^2(e^x.x)}$ is equal to

(1) $-\cot(e\,x^x)+c$ (2) $\tan(e^x.x)+c$

(3) $\tan(e^x)+c$ (4) $\cot(e^x)+c$

14. If x y z are not equal and $\neq 0, \neq 1$ the value of $\begin{vmatrix} \log x & \log y & \log z \\ \log 2x & \log 2y & \log 2z \\ \log 3x & \log 3y & \log 3z \end{vmatrix}$ is equal to

(1) $\log(x\,y\,z)$ (2) $\log(6\,x\,y\,z)$

(3) 0 (4) $\log(x+y+z)$

15. The function $f(x) = [x]$ where $[x]$ the greatest integer function is continuous at

(1) 1.5 (2) 4

(3) 1 (4) -2

16. The value of $\int \frac{e^x(x^2\tan^{-1}x+\tan^{-1}x+1)}{x^2+1}dx$ is equal to

(1) $e^x\tan^{-1}x+c$ (2) $\tan^{-1}(e^x)+c$

(3) $\tan^{-1}(x^e)+c$ (4) $e^{\tan^{-1}x}+c$

Space For Rough Work

17. If $2\vec{a}.\vec{b} = |\vec{a}|.|\vec{b}|$ then the angle between $\vec{a}$ & $\vec{b}$ is

(1) 30° (2) 0°

(3) 90° (4) 60°

18. If $x^m y^n = (x+y)^{m+n}$ then $\frac{dy}{dx}$ is equal to

(1) $\frac{x+y}{xy}$ (2) xy

(3) 0 (4) $\frac{y}{x}$

19. The general solution of $\cot\theta + \tan\theta = 2$ is

(1) $\theta = \frac{n\pi}{2} + (-1)^n \pi/8$ (2) $\frac{n\pi}{2} + (-1)^n \pi/4$

(3) $\theta = \frac{n\pi}{2} + (-1)^n \pi/6$ (4) $\theta = n\pi + (-1)^n \pi/8$

20. The value of $\int_{-\pi/4}^{\pi/4} \sin^{103}x.\cos^{101}x\,dx$ is

(1) $(\pi/4)^{103}$ (2) $\left(\frac{\pi}{4}\right)^{101}$

(3) 2 (4) 0

Space For Rough Work

21. The length of latus rectum of the parabola $4y^2 + 3x + 3y + 1 = 0$ is

(1) $4/3$ (2) 7

(3) 12 (4) $3/4$

22. The value of $\int \frac{e^{6\log x} - e^{5\log x}}{e^{4\log x} - e^{3\log x}} dx$ is equal to

(1) 0 (2) $\frac{x^3}{3}$

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

23. The differential coefficient of $\log_{10} x$ with respect to $\log_x 10$ is

(1) 1 (2) $-(\log_{10} x)^2$

(3) $(\log_x 10)^2$ (4) $\frac{x^2}{100}$

24. The slope of the tangent to the curve $x = t^2 + 3t - 8$, $y = 2t^2 - 2t - 5$ at the point $(2, -1)$ is

(1) $\frac{22}{7}$ (2) $\frac{6}{7}$

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

Space For Rough Work

25. The real part of $(1 - \cos\theta + i \sin\theta)^{-1}$ is

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

(3) $\tan\frac{\theta}{2}$ (4) $\cot\frac{\theta}{2}$

26. $\int_0^{\pi/2} \frac{\sin^{1000} x \, dx}{\sin^{1000} x + \cos^{1000} x}$ is equal to

(1) 1000 (2) 1

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

27. If $1 + \sin\theta + \sin^2\theta + \ldots$ upto $\infty = 2\sqrt{3} + 4$, then $\theta =$ _____

(1) $\pi/6$ (2) $\pi/4$

(3) $\pi/3$ (4) $3\pi/4$

28. $\lim_{x \to 0} \frac{xe^x - \sin x}{x}$ is equal to

(1) 3 (2) 1

(3) 0 (4) 2

Space For Rough Work

29. If $\tan^{-1}(x^2 + y^2) = \alpha$ then $\frac{dy}{dx}$ is equal to

(1) $\frac{-x}{y}$ (2) xy

(3) $\frac{x}{y}$ (4) $-xy$

30. The simplified form of $i^n + i^{n+1} + i^{n+2} + i^{n+3}$ is

(1) 0 (2) 1

(3) -1 (4) i

31. The two curves $x^3 - 3xy^2 + 2 = 0$ and $3x^2y - y^3 = 2$

(1) Touch each other

(2) Cut each other at right angle

(3) Cut at an angle $\pi/3$

(4) Cut at an angle $\pi/4$

32. The equation of the normal to the curve $y(1 + x^2) = 2 - x$ where the tangent crosses x-axis is

(1) $5x - y - 10 = 0$ (2) $x - 5y - 10 = 0$

(3) $5x + y + 10 = 0$ (4) $x + 5y + 10 = 0$

Space For Rough Work

33. The maximum value of $\left(\frac{1}{x}\right)^x$ is

(1) e (2) e^e

(3) $e^{1/e}$ (4) $\left(\frac{1}{e}\right)^e$

34. The solution for the differential equation $\frac{dy}{y}+\frac{dx}{x}=0$ is

(1) $\frac{1}{y}+\frac{1}{x}=c$ (2) $\log x \cdot \log y = c$

(3) $xy=c$ (4) $x+y=c$

35. The order and degree of the differential equation $\left[1+\left(\frac{dy}{dx}\right)^2+\sin\left(\frac{dy}{dx}\right)\right]^{3/4}=\frac{d^2y}{dx^2}$

(1) order = 2, degree = 3 (2) order = 2, degree = 4

(3) order = 2, degree = $\frac{3}{4}$ (4) order = 2, degree = not defined

36. If $\vec{a}$ and $\vec{b}$ are unit vectors then what is the angle between $\vec{a}$ and $\vec{b}$ for $\sqrt{3}\,\vec{a}-\vec{b}$ to be unit vector ?

(1) 30° (2) 45°

(3) 60° (4) 90°

Space For Rough Work

37. The sum of 1st n terms of the series

$$\frac{1^2}{1}+\frac{1^2+2^2}{1+2}+\frac{1^2+2^2+3^2}{1+2+3}+\ldots$$

(1) $\frac{n+2}{3}$ (2) $\frac{n(n+2)}{3}$

(3) $\frac{n(n-2)}{3}$ (4) $\frac{n(n-2)}{6}$

38. The 11^{th} term in the expansion of $\left(x+\frac{1}{\sqrt{x}}\right)^{14}$ is

(1) $\frac{999}{x}$ (2) $\frac{1001}{x}$

(3) i (4) $\frac{x}{1001}$

39. Suppose $\vec{a}+\vec{b}+\vec{c}=0$, $|\vec{a}|=3$, $|\vec{b}|=5$, $|\vec{c}|=7$, then the angle between $\vec{a}$ & $\vec{b}$ is

(1) π (2) $\pi/2$

(3) $\pi/3$ (4) $\pi/4$

40. If a = 3, b = 4, c = 5 each one of $\vec{a},\vec{b}$ & $\vec{c}$ is perpendicular to the sum of the remaining then $|\vec{a}+\vec{b}+\vec{c}|$ is equal to

(1) $\frac{5}{\sqrt{2}}$ (2) $\frac{2}{\sqrt{5}}$

(3) $5\sqrt{2}$ (4) $\sqrt{5}$

Space For Rough Work

41. If the straight lines $2x + 3y - 3 = 0$ and $x + ky + 7 = 0$ are perpendicular, then the value of k is

(1) $^2/_3$ (2) $^3/_2$

(3) $^{-2}/_3$ (4) $^{-3}/_2$

42. The rate of change of area of a circle with respect to its radius at r = 2 cms is

(1) 4 (2) 2π

(3) 2 (4) 4π

43. The value of $\tan\frac{\pi}{8}$ is equal to

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

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

44. Area lying between the curves $y^2 = 2x$ and $y = x$ is

(1) $\frac{2}{3}$ sq. units (2) $\frac{1}{3}$ sq. units

(3) $\frac{1}{4}$ sq. units (4) $\frac{3}{4}$ sq. units

45. If $P(A \cap B) = {}^7/_{10}$ and $P(B) = {}^{17}/_{20}$, where P stands for probability then P(A|B) is equal to

(1) $^7/_8$ (2) $^{17}/_{20}$

(3) $^{14}/_{17}$ (4) $^1/_8$

Space For Rough Work

46. The coefficient of variation of two distributions are 60 and 70. The standard deviation are 21 and 16 respectively, then their mean is

(1) 35 (2) 23

(3) 28.25 (4) 22.85

47. Two cards are drawn at random from a pack of 52 cards. The probability of these two being "Aces" is

(1) $\frac{1}{26}$ (2) $\frac{1}{221}$

(3) $\frac{1}{2}$ (4) $\frac{1}{13}$

48. If $\sin^{-1}x + \sin^{-1}y = \frac{\pi}{2}$, then x^2 is equal to

(1) $1 - y^2$ (2) y^2

(3) 0 (4) $\sqrt{1-y}$

49. The value of $\int_2^8 \frac{\sqrt{10-x}}{\sqrt{x}+\sqrt{10-x}} dx$ is

(1) 10 (2) 0

(3) 8 (4) 3

50. The contrapositive of the converse of the statement "If x is a prime number then x is odd" is

(1) If x is not a prime number then x is odd.

(2) If x is not an odd number then x is not a prime number.

(3) If x is a prime number then it is not odd.

(4) If x is not a prime number then x is not an odd.

Space For Rough Work

51. Two dice are thrown simultaneously, the probability of obtaining a total score of 5 is

(1) $\frac{1}{18}$ (2) $\frac{1}{12}$

(3) $\frac{1}{9}$ (4) $\frac{1}{6}$

52. If $A = \begin{bmatrix} \cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$ and $A + A^T = I$,

where I is the unit matrix of 2×2 & A^T is the transpose of A, then the value of θ is equal to

(1) $\pi/6$ (2) $\pi/3$

(3) π (4) $3\pi/2$

53. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ then $A^2 - 5A$ is equal to

(1) I (2) $-I$

(3) $7I$ (4) $-7I$

54. The value of x if $x(\hat{i} + \hat{j} + \hat{k})$ is a unit vector is

(1) $\pm\frac{1}{\sqrt{3}}$ (2) $\pm\sqrt{3}$

(3) ± 3 (4) $\pm\frac{1}{3}$

55. If $x = 2 + 3\cos\theta$ and $y = 1 - 3\sin\theta$ represent a circle then the centre and radius is

(1) (2, 1), 9 (2) (2, 1), 3

(3) (1, 2), $\frac{1}{3}$ (4) (–2, –1), 3

Space For Rough Work

56. The vector equation of the plane which is at a distance of $3/\sqrt{14}$ from the origin and the normal from the origin is $2\hat{i}-3\hat{j}+\hat{k}$ is

(1) $\vec{r}.(2\hat{i}-3\hat{j}+\hat{k})=3$ (2) $\vec{r}.(\hat{i}+\hat{j}+\hat{k})=9$

(3) $\vec{r}.(\hat{i}+2\hat{j})=3$ (4) $\vec{r}.(2\hat{i}+\hat{k})=3$

57. Find the co-ordinates of the foot of the perpendicular drawn from the origin to the plane $5y+8=0$:

(1) $\left(0,-\frac{18}{5},2\right)$ (2) $\left(0,\frac{8}{5},0\right)$

(3) $\left(\frac{8}{25},0,0\right)$ (4) $\left(0,-\frac{8}{5},0\right)$

58. If $\cos\alpha$, $\cos\beta$, $\cos\gamma$ are the direction cosines of a vector $\vec{a}$, then $\cos 2\alpha+\cos 2\beta+\cos 2\gamma$ is equal to

(1) 2 (2) 3

(3) -1 (4) 0

59. The value of the $\sin 1^\circ+\sin 2^\circ+\ldots..+\sin 359^\circ$ is equal to

(1) 0 (2) 1

(3) -1 (4) 180

60. Integrating factor of $x\frac{dy}{dx}-y=x^4-3x$ is

(1) x (2) $\log x$

(3) $\frac{1}{x}$ (4) $-x$

Space For Rough Work

A-1