TEST PAPER 4

Total Questions: 75 **Time allotted 90 minutes**

1. If $\vec{a} = 2\hat{i} + 2\hat{j} + 3\hat{k}, \vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j}$, then $\vec{a} + t\vec{b}$ is perpendicular to $\vec{c}$, if t is equal to
   (a) 8 (b) 4
   (c) 6 (d) 2

2. The vectors $\hat{i} + 2\hat{j} + 3\hat{k}, \lambda\hat{i} + 4\hat{j} + 7\hat{k}, -3\hat{i} - 2\hat{j} - 5\hat{k}$ are collinear if λ =
   (a) 3 (b) 4
   (c) 5 (d) 16

3. If $\vec{b} = 2\hat{i} + \hat{j} - \hat{k}, \vec{c} = \hat{i} + 3\hat{k}$ and $\vec{a}$ is a unit vector then the Maximum value of $\left[\vec{a}, \vec{b}, \vec{c}\right]$ is
   (a) $\sqrt{59}$ (b) $\sqrt{69}$
   (c) 3 (d) None of these

4. The equation of the sphere passing through the point (1, 3, -2) and the circle $y^2 + z^2 = 25$ and x = 0 is
   (a) $x^2 + y^2 + z^2 + 11x + 25 = 0$
   (b) $x^2 + y^2 + z^2 - 11x + 25 = 0$
   (c) $x^2 + y^2 + z^2 + 11x - 25 = 0$
   (d) $x^2 + y^2 + z^2 - 11x - 25 = 0$

5. If a plane meets the coordinate axes at A, B, C such that centroid of triangle ABC is $\left(\frac{1}{3}, \frac{2}{3}, \frac{4}{3}\right)$, then equation of plane is
   (a) $4x + 2y + z = 4$ (b) $4x + 2y + z = 3$
   (c) $x + y + z = 6$ (d) None of these

6. The foot of perpendicular from (0, 2, 3) to the line $\frac{x+3}{5} = \frac{y-\lambda}{2} = \frac{z+4}{3}$ is
   (a) (-2, 3, 4) (b) (2, -1, 3)
   (c) (2, 3, -1) (d) (3, 2, -1)

7. The AM of ${}^nC_0, {}^nC_1, {}^nC_2, \_\_\_\_ {}^nC_n$ is
   (a) $\frac{2^n}{n+1}$ (b) $\frac{2^n}{n}$
   (c) $\frac{2^{n-1}}{n+1}$ (d) None of these

8. The mean of the values 0, 1, 2, _____ n, with the corresponding weights ${}^nC_0, {}^nC_1, \_\_\_\_ {}^nC_n$ respectively is
   (a) $\frac{2^n}{n+1}$ (b) $\frac{2^{n+1}}{n(n+1)}$

(c) $\frac{n+1}{2}$ (d) $\frac{n}{2}$

9. In a base containing 100 bulbs, 10 bulbs are defective, the probability that out of a sample of 5 bulbs, none is defective is
(a) 10^{-6} (b) 2^{-5}
(c) $(0.9)^5$ (d) 0.9

10. Two dice are thrown, the probability that the sum of the points on the dice is 7, is
(a) 5/36 (b) 6/36
(c) 7/36 (d) 8/36

11. If forces $\vec{P},\vec{Q},\vec{R}$ acting at a point can be represented by the sides of a Δ, taken in order, then,
(a) $\vec{P}+\vec{Q}+\vec{R}=\vec{0}$ (b) $\vec{P}-\vec{Q}+\vec{R}=\vec{0}$
(c) $\vec{P}+\vec{Q}-\vec{R}=\vec{0}$ (d) $\vec{P}-\vec{Q}-\vec{R}=\vec{0}$

12. The sum of the two forces is 18 and their resultant perpendicular to the lesser of the force is 12, then the lesser force is
(a) 5 (b) 3
(c) 7 (d) 15

13. P and Q are like parallel forces. If P is moved parallel to itself through a distance x, then the resultant of P and Q moves through a distance
(a) $\frac{(P-Q)x}{P+Q}$ (b) $\frac{Px}{P-Q}$
(c) $\frac{Px}{P+Q}$ (d) None of these

14. A man is running with a velocity of 5 km/hr in a shower of rain which is descending with a velocity of 10 km/hr. If α be the angle which the apparent direction of the rain which the apparent direction of the rain makes with the vertical then value of tan α is
(a) 1/3 (b) 2/3
(c) ½ (d) None of these

15. A gun can fire with a velocity u in all directions from a given position on a horizontal plane. The shots will fall on the plane within a circle of radius
(a) $\frac{\mu}{2g}$ (b) $\frac{\mu}{g}$
(c) $\frac{\mu^2}{2g}$ (d) $\frac{\mu^2}{g}$

16. An engine and train weights 420 tons and the engine exerts a force of 7 tons. If the resistance to motion be 14 lbs wt per ton, then the time, the train will take to acquire a velocity of 30m/hr from rest is
(a) 2.2 min (b) 2.6 min
(c) 2.8 min (d) 3 min

17. A light string passing over a light smooth Pulley Carries masses of 3kg and 5 kg at its ends. If the string breaks after the masses have moved 9m, how much further the 3 kg man will rise? (take g = 10m/sec)
(a) 1.75 m (b) 1.95 m

(c) 2.05 m (d) 2.25 m

18. $\left(\frac{1-i}{1-i}\right)^{20}$ is equal to

(a) 1 (b) -1/2

(c) $\frac{1}{\sqrt{2}}$ (d) -1

19. The unit place's digit in the number $13^{25}+11^{25}-3^{25}$ is:

(a) 0 (b) 1

(c) 2 (d) 3

20. Number lying between 999 and 10000 that can be formed from the digits 0,2, 3, 6, 7, 8 (repetition of digits not allowed) are

(a) 100 (b) 200

(c) 300 (d) 400

21. If $3^{10}+x=123456798$, then

(a) 2 is factor of x (b) 3 is a factor of x

(c) 6 is a factor of x (d) x has no factor, a sit is prime number.

22. The least common multiple of $6ab^2(a+b)^2$ and $4a^2b(a^2-b^2)$ is

(a) $24a^3b^3(a+b)^2(a^2-b^2)$

(b) $12a^2b^2(a+b)^2(a^2-b^2)$

(c) $4ab(a+b)(a-b)$

(d) $2ab(a+b)$

23. The value of the recurring 0.49 is --

(a) 49/990 (b) 490/99

(c) 49/99 (d) None of these

Directions (Q. 24-25) The following items consists of two statements, one labeled as the Assertion (A) and the other as Reason (R). You are to examine these two statements carefully and select the answer to these items using the codes given below :

Codes :

(a) Both A and R are individually true and R is the correct explanations of A.
(b) Both A and R are individually true, and R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

24. Assertion (A):

$(\cos\theta+i\sin\phi)^3=\cos 3\theta+i\sin 3\phi$

Reason (R) :

$\left(\cos\pi/4+i\sin\pi/4\right)^2=i$

25. Assertion (A):

In the equation $ax^2+3x+5=0$ if one root is reciprocal of the other then a is equal to 5.

Reason (R):

Product of the roots is 1.

26. The roots of the equation $2^{x+2}.3^{\frac{3x}{x-1}} = 9$ are given by

(a) $\log_2\left(\frac{2}{3}\right), -2$ (b) 3, -3

(c) $-2, 1-\frac{\log 3}{\log 2}$ (d) $1-\log_2 3, 2$

27. If α and β are the roots of the equation $x^2 - Px + q = 0$, then the equation whose roots are $\frac{\alpha^2}{\beta}$ and $\frac{\beta^2}{\alpha}$ is

(a) $qx^2 + \left(P^3 - 3Pq\right)x + q^2 = 0$

(b) $qx^2 - \left(P^3 + 3Pq\right)x + q^2 = 0$

(c) $qx^2 - \left(P^3 - 3Pq\right)x + q^2 = 0$

(d) None of these

28. If one root of $x^2 + Px + q = 0$ is 5 – 3i, then the real values of P and q are

(a) $P = -10, q = -34$ (b) $P = -10, q = 34$

(c) $P = 10, q = -34$ (d) None of these

29. The positive integer r, such that ${}^{15}C_{3r} = {}^{12}C_{r+3}$ is equal to

(a) 3 (b) 4

(c) 5 (d) None of these

30. The sum of the digits in the unit place of all the numbers formed with the help of 3, 4, 5, 6 taken all at a time

(a) 432 (b) 108

(c) 36 (d) 18

31. 4 letter lock consists of three rings each marked with 10 different letters, the number of ways in which it is possible to make an unsuccessful attempt to open the lock, is

(a) 899 (b) 999

(c) 479 (d) None of these

32. The 13^{th} term of $\left(9x - \frac{1}{3\sqrt{x}}\right)^{18}$ is

(a) 17682 (b) 18564

(c) $18564\, x^6$ (d) None of these

33. If $\left(1 + x - 2x^2\right)^6 = 1 + a_1x + a_2x^2 + \_\_\_ + a_{12}x^{12}$, then $a_2 + a_4 + a_6 + \_\_\_ + a_{12} =$

(a) 21 (b) 16

(c) 10 (d) None of these

34. If the coefficients of $(2r + 1)^{th}$ term and $(r + 2)^{th}$ term in the expansions of $(1 + x)^{43}$ are equal, then r =

(a) 14 (b) 16

(c) 10 (d) None of these

35. The power of x occurring in the 7^{th} term in the expansion of $\left(\frac{4x}{5}-\frac{8}{5x}\right)^2$ is

(a) -5 (b) 5
(c) -3 (d) 3

36. The coefficient of x^n in the series $\frac{1+x}{1!}+\frac{(1+x)^2}{2!}+\frac{(1+x)^3}{3!}+\_\_\_$ is

(a) $\frac{2e}{n!}$ (b) $\frac{4e}{n!}$

(c) $\frac{e}{n!}$ (d) None of these

37. The sum of the series $\log_4 2-\log_8 2+\log_{16} 2\_\_\_\infty$ is

(a) e^2 (b) $\log_e 2 + 1$
(c) $\log_e 2 - 1$ (d) $1 - \log_e 2$

38. If $A=\begin{pmatrix}1 & 2\\ 2 & 1\end{pmatrix}$, then adj A is equal

(a) $\begin{pmatrix}-1 & 2\\ 2 & -1\end{pmatrix}$ (b) $\begin{pmatrix}1 & -2\\ -2 & 1\end{pmatrix}$

(c) $\begin{pmatrix}2 & 1\\ 1 & 1\end{pmatrix}$ (d) $\begin{pmatrix}1 & -2\\ -2 & 1\end{pmatrix}$

39. If $A=\begin{bmatrix}\cos\alpha & \sin\alpha\\ -\sin\alpha & \cos\alpha\end{bmatrix}$, then A^2 is equal to

(a) $\begin{bmatrix}\sin 2\alpha & \cos 2\alpha\\ \cos 2\alpha & -\sin 2\alpha\end{bmatrix}$ (b) $\begin{bmatrix}\cos 2\alpha & -\sin\alpha\\ -\sin\alpha & \cos 2\alpha\end{bmatrix}$

(c) $\begin{bmatrix}\cos 2\alpha & \sin 2\alpha\\ -\sin 2\alpha & \cos 2\alpha\end{bmatrix}$ (d) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

40. If the system of equations $\lambda x+2y-2z=1, 4x+2\lambda y-z=2, 6x+6y+\lambda z=3$ has a unique solution, then

(a) $\lambda \neq 1$ (b) $\lambda \neq 2$
(c) $\lambda \neq 3$ (d) None of these

41. $\Delta=\begin{vmatrix}1 & 1+ac & 1+bc\\ 1 & 1+ad & 1+bd\\ 1 & 1+ae & 1+be\end{vmatrix}=$

(a) a + b + c (b) 3
(c) 1 (d) 0

42. Let $A\{a,b,c\}, B=\{b,c,d\}, C=\{a,b,d,e\}$, then $A\cap(B\cup C)$

(a) c (b) $\{a,b,c\}$

(c) $\{b,c,d\}$ (d) $[a,b,d,e]$

43. If a = (2, 1, - 1), b = (1, -1, 0) and c = (5, -1, 1), then the unit vector parallel to a + b – c, but in the opposite direction is

(a) $\frac{-1}{3}(2i - j + 2k)$ (b) $\frac{1}{3}(2i - j + 2k)$

(c) $\frac{1}{3}(2i + j - 2k)$ (d) None of these

44. Given two vectors $\hat{i} - \hat{j}$ and $\hat{i} + 2\hat{j}$, the unit vector coplanar with the two vectors and perpendicular to first is

(a) $\frac{1}{\sqrt{2}}(\hat{i} + \hat{j})$ (b) $\frac{1}{\sqrt{5}}(2\hat{i} + \hat{j})$

(c) $\pm\frac{1}{\sqrt{2}}(\hat{i} + \hat{j})$ (d) None of these

45. The direction cosines of the line which is perpendicular to the line whose direction cosines are proportional to (1, -1, 2) and (2, 1, -1) are

(a) $\frac{1}{\sqrt{35}}, \frac{-5}{\sqrt{35}}, \frac{3}{\sqrt{35}}$ (b) $\frac{-1}{\sqrt{35}}, \frac{5}{\sqrt{35}}, \frac{3}{\sqrt{35}}$

(c) $\frac{1}{\sqrt{35}}, \frac{5}{\sqrt{35}}, \frac{3}{\sqrt{35}}$ (d) None of these

46. A plane which passes through the point (3, 2, 0) and the line $\frac{x-y}{1} = \frac{y-7}{5} = \frac{z-4}{4}$ is

(a) $x - y + z = 1$ (b) $x + y + z = 5$

(c) $x + 2y - z = 1$ (d) $2x - y + z = 5$

47. The probability of getting the sum as a prime number when two dice are through together is

(a) $\frac{1}{2}$ (b) $\frac{7}{12}$

(c) $\frac{5}{12}$ (d) None of these

48. If the mean of numbers 27, 31, 89, 107, 156 is 82, then the mean of 130, 126, 68, 50, 1 is

(a) 80 (b) 82

(c) 157 (d) 75

49. Two forces act an angle of 120^0. It the greater force is represented by 80 kg and the resultant is at right angles to the smaller then the smaller force is

(a) 10 kg (b) 15 kg

(c) 20 kg (d) 40 kg

50. A jet plane is rising vertically with a velocity of 10 m/s. It has reached a certain height when the pilot drops a coin, which makes 4 seconds to hit the ground. Assuming that there is no resistance to the motion of the coin, the height of the plane and the velocity of the coin on impact with the ground are

(a) 38.4m, 29.2m/sec (b) 38.4m, 28.7m/sec

(c) 26.5m, 13.5m/sec (d) None of these

51. The term independent of x in the expansion of $\left(x^2 - \frac{1}{3x}\right)^9$ is equal to

(a) $\frac{28}{81}$ (b) $\frac{28}{243}$

(c) $-\frac{28}{243}$ (d) $-\frac{28}{81}$

52. If the coefficients of x^7 and x^8 in $\left(2+\frac{x}{3}\right)^n$ are equal, then the value of *n* is:

(a) 56 (b) 63

(c) 64 (d) None of these

53. If A and B are coefficients of x^n in the expansions of $(1+x)^{2n}$ and $(1+x)^{2n-1}$ respectively, then

(a) A = B (b) 2A = B

(c) A = 2B (d) None of these

54. The value of $\log_{13}+\log\frac{1}{13}$ is

(a) 13 (b) zero

(c) 1 (d) None of these

55. If $\log(2x-3)+\log(x+1)=2\log 5$, the value of *x* is

(a) 3 (b) $-7/2$

(c) $-5/12$ (d) $3/2$

56. If $\log_2\left[\log_3(\log_2 x)\right]=1$, the *x* is equal

(a) 0 (b) 12

(c) 128 (d) 512

57. The value of $\log_4 128$ is

(a) 2 (b) 3

(c) $5/2$ (d) $7/2$

58. If $\begin{bmatrix} x & x+y & x+y+z \\ 2x & 3x+2y & 4x+3y+2z \\ 3x & 6x+3y & 10x+6y+3z \end{bmatrix}=64$,

then the value of *x* is equal to

(a) 6 (b) 4

(c) 3 (d) 2

59. For positive numbers *x*, *y* and *z*, the numerical value of the determinant: $\begin{bmatrix} 1 & \log x^y & \log x^z \\ \log y^x & 3 & \log y^z \\ \log z^x & \log z^y & 5 \end{bmatrix}$

is:

(a) 0 (b) $\log x, \log y.\log z$

(c) 1 (d) 8

60. For a matrix $\begin{pmatrix} 1 & 3 & \lambda+2 \\ 2 & 4 & 8 \\ 3 & 5 & 10 \end{pmatrix}$ to be singular, λ has the value:

(a) -2 (b) 4
(c) 2 (d) -4

61. The value of $\sin 50^0 \cos 10^0 + \cos 50^0 \cos 80^0$ is

(a) $\frac{\sqrt{3}}{2}$ (b) $\frac{1}{2}$
(c) $\sin 40^0$ (d) $\cos 40^0$

62. If A + C = B, then tan *A* tan *B* tan *C* is equal to

(a) $\tan B + \tan A + \tan C$ (b) $\tan B - \tan A + \tan C$
(c) $\tan B - \tan A - \tan C$ (d) $\tan B + \tan A - \tan C$

63. The value of $\sin 50^0 - \sin 70^0 + \sin 10^0$ is

(a) 1 (b) $\frac{1}{2}$
(c) -1 (d) 0

64. If $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$,then $\cos\theta + \sin\theta$ is

(a) $\sqrt{2}\cos\theta$ (b) $\sqrt{2}\sin\theta$
(c) $\sqrt{2}$ (d) 1

65. In a triangle $a = 13$, $b = 14$, $c = 15$, then r is:

(a) 4 (b) 8
(c) 2 (d) 6

66. The eccentricity of the ellipse $5x^2 + 9y^2 = 45$ is

(a) $\frac{5}{9}$ (b) $\frac{9}{5}$
(c) $\frac{2}{5}$ (d) $\frac{2}{3}$

67. The straight line $y + x - k = 0$ touches the curve $y = x - x^2$ for k =

(a) 0 (b) 1
(c) -1 (d) None of these

68. The ratio in which the *yz* – Plane divides the join of the points $(-2,4,7)$ and $(3,-5,8)$ is:

(a) 2 : 3 (b) 3 : 2
(c) -2 : 3 (d) 4 : -3

69. A (3, 2, 0) , B (5, 3, 2),C (-9, 6, -3) are the vertices of a triangle ABC. If the bisectors of ∠ABC meets BC at D, then the coordinates of D are

(a) $\left(\frac{19}{8}, \frac{57}{16}, \frac{17}{16}\right)$ (b) $\left(\frac{-19}{8}, \frac{57}{16}, \frac{17}{16}\right)$
(c) $\left(\frac{19}{8}, \frac{57}{16}, \frac{-17}{16}\right)$ (d) $\left(\frac{19}{8}, \frac{-57}{16}, \frac{17}{16}\right)$

70. If $f(x)=\frac{3x+2}{5x-3}$, then

(a) $f^{-1}(x)=f(x)$ (b) $(fof)x=-x$

(c) $f^{-1}(x)=-f(x)$ (d) $f^{-1}(x)=\frac{-1}{19}f(x)$

71. $\underset{x\to 1}{Lt}\frac{1+(x-1)^2}{1+x^2}$ is:

(a) 1 (b) 3

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

72. $\underset{x\to 1}{Lt}\frac{x^2-4x+3}{x^2+2x-3}$ is:

(a) $\frac{1}{2}$ (b) $-\frac{1}{2}$

(c) $-\frac{1}{3}$ (d) $\frac{1}{3}$

73. $\underset{x\to 1}{u}\frac{x^2-\tan 2x}{x^2+2x-3}$ is:

(a) $-\frac{1}{2}$ (b) 2

(c) -2 (d) $\frac{1}{2}$

74. If $y=\log_e(x-2)^2$ for $x\neq 0$, 2, then the value of $y^1(3)$ is:

(a) $\frac{2}{3}$ (b) $\frac{1}{3}$

(c) $\frac{4}{3}$ (d) None of these

75. $\int_0^{\pi/2}\frac{dx}{1+\sin x}dx$ is equal to:

(a) 0 (b) $\frac{1}{2}$

(c) 1 (d) $\frac{3}{2}$

ANSWER KEYS

1.	(a)	16.	(b)	31.	(b)	46.	(a)	61.	(a)
2.	(a)	17.	(d)	32.	(b)	47.	(c)	62.	(c)
3.	(a)	18.	(a)	33.	(c)	48.	(d)	63.	(d)
4.	(c)	19.	(b)	34.	(a)	49.	(d)	64.	(a)
5.	(a)	20.	(c)	35.	(c)	50.	(a)	65.	(a)
6.	(d)	21.	(b)	36.	(c)	51.	(b)	66.	(d)
7.	(b)	22.	(b)	37.	(d)	52.	(b)	67.	(b)
8.	(d)	23.	(c)	38.	(d)	53.	(c)	68.	(a)
9.	(c)	24.	(a)	39.	(c)	54.	(b)	69.	(a)
10.	(b)	25.	(d)	40.	(b)	55.	(b)	70.	(a)
11.	(a)	26.	(c)	41.	(d)	56.	(d)	71.	(c)
12.	(a)	27.	(c)	42.	(b)	57.	(d)	72.	(b)
13.	(c)	28.	(b)	43.	(b)	58.	(b)	73.	(c)
14.	(c)	29.	(a)	44.	(a)	59.	(d)	74.	(d)
15.	(c)	30.	(b)	45.	(b)	60.	(b)	75.	(c)