Code No.	R – 2117

Entrance Examination for Admission to the P.G. Courses in the Teaching Departments, 2023

CSS

MATHEMATICS/MATHEMATICS WITH FINANCE AND COMPUTATION

General Instructions

1. The Question Paper is having 100 Objective Questions, each carrying one mark.
2. The answers are to be (✓) 'tick marked' **only** in the "**Response Sheet**" provided.
3. **Negative marking** : **0.25 marks** will be deducted for each wrong answer .

Time : 2 Hours **Max. Marks : 100**

To be filled in by the Candidate									
Register Number	in Figures								
	in words								

Choose appropriate answer from the options in the questions.

($100 \times 1 = 100$ marks)

1. The group $S_3 \times \mathbb{Z}_2$Is isomorphic to which of the following groups?
   a) $\mathbb{Z}_{12}$
   b) A_4, the alternating group of order 12
   c) $\mathbb{Z}_6 \times \mathbb{Z}_2$
   d) D_6, the dihedral group of order 12

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2. Which of the following rings is a PID?

   a) $\mathbb{Q}\,[X, Y]/\langle X\rangle$

   b) $\mathbb{Z} \oplus \mathbb{Z}$

   c) $\mathbb{Z}\,[X]$

   d) $M_2(\mathbb{Z})$,the ring of 2×2 matrices with entries in $\mathbb{Z}$

3. In which of the following fields, the polynomial $x^3 - 312312x + 123123$ is irreducible in $\mathbb{F}[x]$?

a) The field $\mathbb{F}_3$ with 3 elements

b) The field $\mathbb{F}_7$ with 7 elements

c) The field $\mathbb{F}_{13}$ with 13 elements

d) The field $\mathbb{Q}$ of rational numbers

4. Which of the following are true statements? S_n denotes the symmetric group on n letters, for some $n \geq 1$

a) S_n always contains an element of order strictly greater than n

b) If σ_1, σ_2 are elements of order 2, then $\sigma_1\sigma_2$ has order 1 or 2

c) If σ_1, σ_2 are elements of order 3, then $\sigma_1\sigma_2$ has order 1 or 3

d) If $\sigma \in S_n$ has order 3, then σ^2 has order 3

5. Which is one of the following is true?

a) $\mathbb{Z}[x]$ is a principal ideal domain

b) $\mathbb{Z}[x]$ is an unique factorization domain

c) $\mathbb{Z}[x]$ is a Euclidean domain

d) $\mathbb{Z}[x]$ is an integral domain, but not a field

6. The number of non-abelian groups of order 8 is

a) 1 b) 2

c) 4 d) 5

7. Let H be a cyclic subgroup of G of order 32. Then the number of generator of H is

a) 4 b) 8

c) 16 d) 32

8. Let $a = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, $b = \begin{bmatrix} 0 & 2 \\ \frac{1}{2} & 0 \end{bmatrix} \in GL\,(2,\ \mathbb{R})$ and $O(a) = O(b) = 2$. Then $O(ab) =$

a) 2
b) 4
c) 8
d) none of these

9. Which of the following is a bilinear transformation?

a) $T(z) = i\ \mathrm{Im}(z)$
b) $T(z) = z^3$
c) $T(z) = \bar{z}$
d) $T(z) = \frac{1}{z}$

10. Which of the following is not true?

a) $\mathbb{C}$ is a vector space over $\mathbb{R}$

b) $\mathbb{Z}$ is a vector space over $\mathbb{R}$

c) $\mathbb{R}$ is a vector space over $\mathbb{R}$

d) $\mathbb{C}$ is a vector space over $\mathbb{C}$

11. A set of single nonzero vector is

a) linearly dependent
b) linearly independent
c) basis
d) none of these

12. Which one of the following is not true?

a) $\dim_{\mathbb{C}} (\mathbb{C}\times\mathbb{C})=2$
b) $\dim_{\mathbb{R}} (\mathbb{C}) = 2$
c) $\dim_{\mathbb{R}} (\mathbb{C}\times\mathbb{C}) = 2$
d) $\dim_{\mathbb{C}} (\mathbb{C}) = 1$

13. Let the linear transformation $T; \mathbb{R}^2 \rightarrow \mathbb{R}^3$ be defined by $T(x_1,\ x_2) = (x_1, x_1 + x_2, x_2)$ then the nullity of T is

a) 0
b) 1
c) 2
d) 3

14. Let n be a positive integer and let $M_n(\mathbb{R})$ denote the space of all n x n real matrices. If T : $M_n(\mathbb{R}) \to M_n(\mathbb{R})$ is a linear transformation such that $T(A) = 0$ whenever $A \in M_n(\mathbb{R})$ is symmetric or skew-symmetric, then the rank of T is

a) 0

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

c) n

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

15. The dimension of the vector space of all symmetric matrix $A = (a_{ij})$ of order n x n $(n \geq 2)$ with real entries $a_{11} = 0$ and trace zero is

a) $\frac{n^2+n-4}{2}$

b) $\frac{n^2-n+4}{2}$

c) $\frac{n^2+n-3}{2}$

d) $\frac{n^2-n+3}{2}$

16. Which of the following is not complete?

a) Set of all real numbers $\mathbb{R}$ with usual metric

b) Set of all rational numbers $\mathbb{Q}$ with usual metric

c) [0, 1] with usual metric

d) Any discrete metric space

17. In a discrete metric space, the only connected subsets are

a) finite sets

b) the whole space

c) singleton sets

d) all proper subsets

18. Let f be a continuous function defined on $\mathbb{R}$ (with usual metric) into itself and let $A = \{x \in \mathbb{R} : f(x) = 0\}$. Then what best can you say of A?

a) A is closed

b) A is open

c) A is bounded

d) A is compact

19. Which of the following subset of $\mathbb{R}$ with usual metric is neither compact nor connected?

a) $\mathbb{R}$ b) (0, 1)

c) [0, 100] d) $\mathbb{Q}$

20. Which of the following subset is open in …. with usual metric?

a) $\mathbb{Q}$ b) $\left\{1, \frac{1}{2}, \frac{1}{3}, \ldots\right\}$

c) $\mathbb{Z}$ d) $\mathbb{R} - \mathbb{Z}$

21. Which of the following is not a compact subset of …. with usual metric?

a) $\{x \in \mathbb{R} : x \geq 0\}$ b) [0, 1]

c) $[-1, 1] \cup [-3, -2]$ d) any finite subset

22. What is $\overline{A}$ if $A = \left(0, \frac{1}{10}\right)$ in the metric space $M = (0, 1)$ with usual distance metric?

a) $\left(0, \frac{1}{10}\right)$ b) $\left(0, \frac{1}{10}\right]$

c) $\left[0, \frac{1}{10}\right]$ d) $\left[0, \frac{1}{10}\right)$

23. Which of the following is true?

a) A non-empty subset of a complete metric space is complete

b) A non-empty subset of a compact metric space is compact

c) A non-empty subset of a totally bounded set is totally bounded

d) A non-empty subset of a connected metric space is connected

24. Which of the following is a convergent series?

a) $\sum_{n=1}^{\infty} \frac{1}{(\log n)^n}$ b) $\sum_{n=1}^{\infty} \frac{1}{n(\log n)}$

c) $\sum_{n=1}^{\infty} \frac{1}{n(\log n)^{\frac{1}{2}}}$ d) $\sum_{n=2}^{\infty} \frac{1}{\log n}$

25. Let (a_n) be given by $a_1 = \sqrt{2}$ and $a_{n+1} = \sqrt{2a_n}$ for all $n \geq 1$. Then $\lim_{n \to \infty} a_n$ is

a) $\sqrt{2}$ b) 2

c) 1 d) ∞

26. If $p \neq 0, \beta$ are real and $\alpha\overline{\alpha} - p\beta \geq 0$, then the equation $pz\overline{z} + \alpha\overline{z} + \overline{\alpha}z + \beta = 0$ represents.

a) real axis b) a straight line

c) a circle d) imaginary axis

27. The number of limit points of the sequence {1, 2, 3, 4, 5, 1, 2, 3, 4, 5, 1, 2, 3, 4, 5, … } is

a) 2 b) 3

c) 5 d) 10

28. What values of *x* for which the function $x^3 - 3x^2 + 6$ is decreasing?

a) $x = 0$ b) $x < 2$

c) $x > 2$ d) $x > 3$

29. The envelope of the family of curves $Pt^2 + Qt + R = 0$, where *t* is a parameter, is

a) $Q^2 = 4PRQ = 4PR$ b) $R = 2PQ$

c) $Q = 4PR$ d) $R^2 = 4PQ$

30. The number of evolutes for a curve is

a) always one b) always finite

c) always infinite d) none of these

31. The number of asymptotes parallel to the *x*-axis for the curve $x^2y^2 = c^2(x^2 + y^2)$ is

a) one b) two

c) three d) either two or three

32. If the equation of a curve contains only even powers of x, then the curve is symmetric about

a) y-axis
b) x-axis
c) both x-axis and y-axis
d) origin

33. The equation of the tangent to the parabola $y^2 = 8x$ at the point (1, 2) is

a) $y = 2x + 2$
b) $2y = x + 2$
c) $y = 4x + 4$
d) $2y = x - 2$

34. The pole of the line $Ax + By + C = 0$ with respect to the parabola $y^2 = 4ax$ is

a) $\left(\frac{C}{A}, -\frac{2aB}{A}\right)$
b) $\left(\frac{C}{B}, -\frac{2aA}{B}\right)$
c) $\left(\frac{A}{C}, -\frac{2aB}{C}\right)$
d) $\left(\frac{C}{A}, -\frac{2aC}{B}\right)$

35. The radius of the sphere $2x^2 + 2y^2 + 2z^2 - 2x + 4y + 2z = 15$ is

a) 4
b) 5
c) 6
d) none of these

36. The image of the point $(2, -3, -7)$ under the reflection in the plane $Y = 0$ is

a) (2, 3, 7)
b) (–2, 3, 7)
c) (–2, 3, –7)
d) (2, –3, 7)

37. The equation of the plane through (1, –2, 3) and parallel to the plane $3x + 4y - z + 4 = 0$ is

a) $4x + 3y - z + 12 = 0$
b) $4x - 3y - z + 12 = 0$
c) $3x + 4y - z + 8 = 0$
d) $3x + 4y - z - 8 = 0$

38. If the projections of a line on the *X, Y, Z* axes are 2, 6, 3 respectively, then the length of the line is

a) 49 b) 7

c) 11 d) 14

39. A surface generated by a line which is always parallel to a fixed line in space is generally called a

a) cylinder b) right circular cone

c) cone d) right circular cylinder

40. The direction cosines of a plane parallel to the plane $X = 0$ are proportional to (here c is any constant)

a) 0, 0, c b) 0, c, 0

c) c, 0, 0 d) c, c, 0

41. The equation of the plane, making intercepts *p, q, r* on the coordinate axes *OX, OY, OZ* respectively, is

a) $px + qy + rz = 0$ b) $px + qy + rz = 1$

c) $\frac{p}{x} + \frac{q}{y} + \frac{r}{z} = 1$ d) $\frac{x}{p} + \frac{y}{q} + \frac{z}{r} = 1$

42. The equation $x^2 + y^2 + z^2 + x - y - z + 1 = 0$, $x - y - z + 1 = 0$ taken together represents a

a) sphere b) plane

c) cone d) circle

43. The residue of $\frac{ze^z}{(z-1)^3}$ at its pole is

a) $\frac{e}{2}$ b) $\frac{3e}{4}$

c) $\frac{3e}{2}$ d) $\frac{e}{4}$

44. The radius of convergence of the series $\sum_{n=1}^{\infty} \frac{z^n}{n^2}$ is

a) e

b) $\frac{1}{e}$

c) 1

d) 5

45. The conjugate of a complex number is $\frac{1}{i-1}$. Then that complex number is

a) $\frac{-1}{i-1}$

b) $\frac{1}{i+1}$

c) $\frac{-1}{i+1}$

d) $\frac{1}{i-1}$

46. Let $f(z) = e^{\frac{1}{z}}$. Then

a) f is analytic at $z = 0$

b) f has simple pole at $z = 0$

c) f has removable singularity at $z = 0$

d) f has essential singularity at $z = 0$

47. Let $f(z) = \frac{z^2}{z+2}$. Then the maximum value of $|f(z)|$ in $\{z \in \mathbb{C}: |z| \leq 1$ is

a) 1/3

b) 1

c) 3/2

d) 2

48. Which of the following function is differentiable only at $z = 0$?

a) $f(z) = \operatorname{Re} z$

b) $f(z) = \operatorname{Im} z$

c) $f(z) = \bar{z}$

d) $f(z) = |z|^2$

49. The residue of $\dfrac{(z^2-2z)}{(z+1)^2(z^2+4)}$ at $z = 2i$ is

a) $\dfrac{7+i}{25}$

b) $\dfrac{7-i}{25}$

c) $\dfrac{-14}{25}$

d) $\dfrac{14}{25}$

50. The region of convergence of the power series $\sum_{n=1}^{\infty} nz^{n-1}$ is

a) $1<|z|<2$

b) $|z|<1$

c) $|z|<2$

d) $2<|z|$

51. The solution of a partial differential equation $2p+3q=1$ is

a) $\phi(3x+2y,\ y+3z)=0$

b) $\phi(3x+2y,\ y-3z)=0$

c) $\phi(3x-2y,\ y+3z)=0$

d) $\phi(3x-2y,\ y-3z)=0$

52. The differential equation of all spheres whose centres lie on the z-axis is

a) $p=q$

b) $py=qx$

c) $px=qy$

d) $z=px+qy$

53. The solution of the differential equation $(x^2+1)\dfrac{dy}{dx}+(y^2+1)=0$ is

a) $y=2+x^2$

b) $y=\dfrac{x+1}{1-x}$

c) $y=x(x-1)$

d) $y=\dfrac{1-x}{1=x}$

54. The particular integral of $(D-5)(D-4)y=1000$ is

a) –50

b) 100

c) –100

d) 50

55. A general solution of the second order equation $4u_{xx} - u_{yy} = 0$ is of the form $u(x, y) =$

a) $f(x) + g(y)$ b) $f(x+2y) + g(x-2y)$

c) $f(x+4y) + g(x-4y)$ d) $f(4x+y) + g(4x-y)$

56. If $f : \mathbb{R} \to \mathbb{R}$ is defined by $f(x) = \begin{cases} -1 & if \;\; x \; rational \\ 1 & if \;\; x \; irrational \end{cases}$, then $f^{-1}(\{0, 1, 2\})$ is

a) ϕ b) $\mathbb{Q}$

c) $\mathbb{R}$ d) $\mathbb{R} - \mathbb{Q}$

57. The number of proper subsets of $\{1, 2, 3, \ldots, n\}$ having at most two elements is

a) 2^{n+1} b) n^2

c) 2^n d) 2^{n-1}

58. The value of $\lim_{n\to\infty}\left(\frac{1^2 + 2^2 + \ldots + n^2}{n^2}\right)$ is

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

c) $\frac{3}{4}$ d) $\frac{4}{7}$

59. The peak point of the sequence $\left\{1, \frac{1}{2}, \frac{1}{3}, -1, -1, \ldots\right\}$ are

a) 1, –1 b) 1, 2, 3

c) 1, –1, 2 d) 1, 2, 3, –1

60. The value of $\iint dx\,dy$ over the region bounded by $x = 0, x = 2, y = 0, y = 2$ is

a) 4 b) 3

c) 2 d) 0

61. The value of $\iint\limits_A dx\,dy$, where A is a rectangle with vertices (–2, –1), (2, –1), (2, 1) and (–2, 1) is

a) 2　　b) 4

c) 6　　d) 8

62. The integral value $\int\limits_{x=0}^{1} \int\limits_{y=x^2}^{x} f(x, y)dy\ dx$ is equivalent to

a) $\int\limits_{y=x^2}^{x} \int\limits_{x=0}^{1} f(x, y)dx\,dy$　　b) $\int\limits_{y=0}^{1} \int\limits_{x=y}^{\sqrt{y}} f(x, y)dx\,dy$

c) $\int\limits_{y=0}^{1} \int\limits_{x=y^2}^{y} f(x, y)dx\,dy$　　d) $\int\limits_{y=0}^{1} \int\limits_{x=\sqrt{y}}^{y^2} f(x, y)dx\ dy$

63. The value of $\int\limits_C (3x+y)dx+(2y-x)dy$ along the straight line C joining from (0, 5) to (2, 5) is

a) 4　　b) 8

c) 16　　d) 32

64. The ——— statement when executed in a switch statement causes immediate exit from the structure.

a) goto　　b) default

c) break　　d) if..else

65. The largest value that an unsigned char type variable can store is

a) 32767　　b) 127

c) 65535　　d) 255

66. In an exit-controlled loop, if the body is executed n times, then how many times test condition is evaluated?

a) $n+2$ b) $n+1$

c) n d) $n-1$

67. The function __________ does not require any conversion specification to read a string from the keyboard.

a) scanf( ) b) strcmp( )

c) strcpy( ) d) getchar( )

68. A variable declared inside a function by default assumes —— storage class.

a) register b) auto

c) static d) external

69. If $p1$ and $p2$ are both pointers to the same array, which one of the following statements is incorrect?

a) $p1 == p2$ b) $*p2 / *p1$

c) $p2 - p1$ d) $p2 + p1$

70. What is the high level I/O function to write a set of data values to a file?

a) printf( ) b) putw( )

c) putc( ) d) fprintf( )

71. Which of the following is an invalid variable name?

a) constant1 b) 1var

c) total d) sum_value

72. Let $f:[a, b] \to R$ be an integrable function. Define $g:[a, b] \to R$ by $g(x) = \int_x^b f(t)dt$ then

a) g is not differentiable

b) $g'(x) = f(x)$

c) $g'(x) = -f(x)$

d) $g'(x) = g(x) + f(x)$

73. Let D be a non–zero $n \times n$ real matrix with $n \geq 2$. Which of the following implications is valid?

a) $\det(D) = 0$ implies rank $(D) = 0$

b) $\det(D) = 1$ implies rank $(D) \neq 1$

c) rank $(D) = 1$ implies $\det(D) \neq 0$

d) rank $(D) = n$ implies det $(D) \neq 1$

74. The value of $\int_{-1}^{1} |x| \, dx$ is

a) 0

b) –1

c) 1

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

75. Let $(x_n) \to x$ and (y_n) be a sequence such that $|y_n| \leq M$, for all n. Then the sequence $(x_n y_n)$ converges if

a) $x < 0$

b) $x > 0$

c) $x = 0$

d) $x = M$

76. Let (a_n) be a bounded real sequence. Then (a_n) converges if

a) It is a Cauchy sequence

b) it must be a constant sequence

c) it must be monotone

d) it has a convergent subsequence

77. Let (a_n) be a real sequence such that $\left|a_n - a_{(n+1)}\right| \to 0$ as $n \to \infty$. Then

a) (a_n) converges

b) (a_n) is bounded

c) $(|a_n|)$ converges

d) (a_n) need not be convergent

78. Let $a_1 = 8$ and $a_{(n+1)} = \dfrac{a_n}{2} + 2$, for all n. Suppose that $(a_n) \to a$. Then the value of a is

a) 1/4

b) 4

c) 1/8

d) 8

79. Let $a_n = \dfrac{n}{(n^2+1)} + \dfrac{n}{(n^2+2)} + ?+ \dfrac{n}{(n^2+n)}, \forall n$. Then (a_n) is

a) a convergent sequence

b) a bounded sequence but not convergent

c) an unbounded sequence but not diverges to $+\infty$

d) a divergent sequence diverges to $+\infty$

80. For which of the following curves the curvature is constant at every point on the curve?

a) Parabola

b) Ellipse

c) Circle

d) Cycloid

81. Let $f(x) = 2x^3 - 9x^2 + 12x - 11$. Then f attains

a) local maximum at $x = 1$ and local minimum at $x = 2$

b) local minimum at $x = 1$ and local minimum at $x = 2$

c) local maximum at both $x = 1$ and $x = 2$

d) local minimum at both $x = 1$ and $x = 2$

82. Let $f : R \to R$ be an even function and assume that $f'(0)$ exists. Then

a) $f'(0) = 0$

b) $f'(0) = f(0)$

c) $f'(0) = \frac{f(0)}{2}$

d) $f'(0) = \sqrt{f(0)}$

83. The value of $\beta(3, 3)$ is

a) 1/10

b) 1/20

c) 1/30

d) 1/40

84. Let $D = \{z \in C : |z - 1| < 1\}$ and $f : D \to C$ be an analytic function such that $f(1) = 1$ and $|f(z)| < 1$, for all $z \in D$. Then

a) $f(z)$ = 1 for all $z \in D$

b) $f(z)$ = z for all $z \in D$

c) $f(z) = \frac{1}{z}$ for all $z \in D$

d) such function *f* does not exist

85. The region of convergence of the series $\sum_{n=1}^{\infty} \frac{1}{(z^2 + 1)^n}$ is

a) $|z^2 + 1| < 1$

b) $|z^2 + 1| > 1$

c) $|z^2 - 1| < 1$

d) $|z^2 - 1| > 1$

86. The asymptotes of the curve $f(x) = \frac{(x^2 - 5x + 10)}{(x - 3)}$ are

a) $x = 3$ and $y = x$

b) $x = 3$ and x–axis

c) $x = 3$ and $y = x - 2$

d) $x = 3$ and y -axis

87. Which of the following series is not convergent?

a) $\sum_{n=1}^{\infty} \frac{1}{n}$

b) $\sum_{n=1}^{\infty} \frac{1}{n!}$

c) $\sum_{n=1}^{\infty} \frac{1}{n^3}$

d) $\sum_{n=1}^{\infty} \frac{1}{n^4}$

88. The unit normal vector of the surface $xyz = 1$ at the point $(1, 1, 1)$ is

a) $i + j + k$

b) $(i + j + k)/2$

c) $(i + j + k)/\sqrt{2}$

d) $(i + j + k)/\sqrt{3}$

89. The value of k for which $C_1 + kC_2$ is perpendicular to C_3, where $C_1 = i + 2j + 3k$, $C_2 = i + 2j + k$ and $C_3 = 3i + j$, is

a) 3

b) 4

c) 5

d) 6

90. If the angle between two non-zero vectors is greater than $\frac{\pi}{2}$ and smallest than $\frac{3\pi}{2}$, then the dot product of these vectors is

a) zero

b) greater than zero

c) less than zero

d) not defined

91. The Laplace transform of $\int_0^t \int_0^t \int_0^t (t \sin t)\, dt\, dt\, dt$ is

a) $\frac{2}{s^2(s^2+1)^2}$

b) $\frac{2}{s^2(s+1)}$

c) $\frac{2}{s(s+1)^2}$

d) $\frac{2}{s^2(s^2+1)}$

92. The Laplace transform of $\frac{t^5}{e^{2t}}$ is

a) $\frac{6!}{(s+2)^5}$

b) $\frac{5!}{(s+2)^6}$

c) $\frac{5!}{(s-2)^6}$

d) $\frac{6!}{(s-2)^5}$

93. The Laplace transform of $\sin^2 t$ is

a) $\frac{1}{2s}+\frac{s}{2s^2+8}$

b) $\frac{1}{s}+\frac{s}{2s^2+4}$

c) $\frac{1}{s}-\frac{s}{s^2+4}$

d) $\frac{1}{2s}-\frac{s}{2s^2+8}$

94. The inverse Laplace transform of $\frac{s}{(2s^2-8)}$ is

a) $\frac{1}{2}\sinh 2t$

b) $\frac{1}{2}\cosh 2t$

c) $\frac{1}{2}\cos 2t$

d) $\frac{1}{2}\sin 2t$

95. The inverse Laplace transform of $\frac{s}{(s+2)^2}$ is

a) $e^{-2t}(1+t)$

b) $e^{-2t}(1+2t)$

c) $e^{-2t}(1-2t)$

d) $e^{-2t}(1-t)$

96. The angle between two vectors $\vec{a}$ and $\vec{b}$ with respective magnitude 2 and 3 such that $\vec{a} \cdot \vec{b} = 3$ is

a) $\frac{\pi}{2}$ b) 0

c) $\frac{\pi}{6}$ d) $\frac{\pi}{3}$

97. The value of $\vec{i} \cdot (\vec{j} \times \vec{k}) + \vec{j} \cdot (\vec{i} \times \vec{k}) + \vec{k} \cdot (\vec{i} \times \vec{j})$ is

a) 0 b) –1

c) 1 d) 3

98. Find a unit vector parallel to the sum of the vectors $\vec{i} + \vec{j} + \vec{k}$ and $2\vec{i} - 3\vec{j} + 5\vec{k}$

a) $\frac{3}{7}\vec{i} - \frac{2}{7}\vec{j} + \frac{6}{7}\vec{k}$ b) $\frac{3}{7}\vec{i} + \frac{2}{7}\vec{j} + \frac{6}{7}\vec{k}$

c) $\frac{3}{7}\vec{i} - \frac{2}{7}\vec{j} - \frac{6}{7}\vec{k}$ d) $\frac{-3}{7}\vec{i} + \frac{2}{7}\vec{j} + \frac{6}{7}\vec{k}$

99. If $\vec{a}, \vec{b}, \vec{c}$ are the position vectors of the vertices of an equilateral triangle whose orthocentre is at the origin, then

a) $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ b) $\vec{a}^2 = \vec{b}^2 + \vec{c}^2 = \vec{0}$

c) $\vec{a} + \vec{b} = \vec{c}$ d) $\vec{a} = \vec{b} + \vec{c}$

100. The points with position vectors $60i + 3j$, $40i - 8j$, $ai - 52j$ are collinear if

a) $a = -40$ b) $a = 40$

c) $c = 20$ d) $a = -20$

ANSWER SHEET

1	A	B	C	D	E	26	A	B	C	D	E	51	A	B	C	D	E	76	A	B	C	D	E
2	A	B	C	D	E	27	A	B	C	D	E	52	A	B	C	D	E	77	A	B	C	D	E
3	A	B	C	D	E	28	A	B	C	D	E	53	A	B	C	D	E	78	A	B	C	D	E
4	A	B	C	D	E	29	A	B	C	D	E	54	A	B	C	D	E	79	A	B	C	D	E
5	A	B	C	D	E	30	A	B	C	D	E	55	A	B	C	D	E	80	A	B	C	D	E
6	A	B	C	D	E	31	A	B	C	D	E	56	A	B	C	D	E	81	A	B	C	D	E
7	A	B	C	D	E	32	A	B	C	D	E	57	A	B	C	D	E	82	A	B	C	D	E
8	A	B	C	D	E	33	A	B	C	D	E	58	A	B	C	D	E	83	A	B	C	D	E
9	A	B	C	D	E	34	A	B	C	D	E	59	A	B	C	D	E	84	A	B	C	D	E
10	A	B	C	D	E	35	A	B	C	D	E	60	A	B	C	D	E	85	A	B	C	D	E
11	A	B	C	D	E	36	A	B	C	D	E	61	A	B	C	D	E	86	A	B	C	D	E
12	A	B	C	D	E	37	A	B	C	D	E	62	A	B	C	D	E	87	A	B	C	D	E
13	A	B	C	D	E	38	A	B	C	D	E	63	A	B	C	D	E	88	A	B	C	D	E
14	A	B	C	D	E	39	A	B	C	D	E	64	A	B	C	D	E	89	A	B	C	D	E
15	A	B	C	D	E	40	A	B	C	D	E	65	A	B	C	D	E	90	A	B	C	D	E
16	A	B	C	D	E	41	A	B	C	D	E	66	A	B	C	D	E	91	A	B	C	D	E
17	A	B	C	D	E	42	A	B	C	D	E	67	A	B	C	D	E	92	A	B	C	D	E
18	A	B	C	D	E	43	A	B	C	D	E	68	A	B	C	D	E	93	A	B	C	D	E
19	A	B	C	D	E	44	A	B	C	D	E	69	A	B	C	D	E	94	A	B	C	D	E
20	A	B	C	D	E	45	A	B	C	D	E	70	A	B	C	D	E	95	A	B	C	D	E
21	A	B	C	D	E	46	A	B	C	D	E	71	A	B	C	D	E	96	A	B	C	D	E
22	A	B	C	D	E	47	A	B	C	D	E	72	A	B	C	D	E	97	A	B	C	D	E
23	A	B	C	D	E	48	A	B	C	D	E	73	A	B	C	D	E	98	A	B	C	D	E
24	A	B	C	D	E	49	A	B	C	D	E	74	A	B	C	D	E	99	A	B	C	D	E
25	A	B	C	D	E	50	A	B	C	D	E	75	A	B	C	D	E	100	A	B	C	D	E

ROUGH WORK

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