MASTER CADRE
Question Paper 2016

1. The function $f(x)=\begin{cases} x^n \sin\left(\frac{1}{x}\right), & x\neq 0 \\ 0 & x=0 \end{cases}$ is differentiable at $x=0$ if

a) $p>0$ b) $p=0$

c) $p>1$ d) $p=1$

2. If $y=\tan^{-1}\left(\frac{\sin x}{1+\cos x}\right)$, then $\frac{dy}{dx}=$

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

c) $\frac{1}{4}$ d) $-\frac{1}{4}$

3. The value of $\frac{d}{dx}\left(x^x\right)$ is

a) x^{x-1} b) $x^x \log(ex)$

c) $x^x \log x$ d) $x^{x-1}\log x$

4. If $x=a(t-\sin t),\ y=a(1+\cos t)$ then $\frac{dy}{dx}=$

a) $-\tan\left(\frac{t}{2}\right)$ b) $\cot\left(\frac{t}{2}\right)$

c) $-\cot\left(\frac{t}{2}\right)$ d) $\tan\left(\frac{t}{2}\right)$

5. If $x=t^2,\ y=t^3$ then $\frac{d^2y}{dx^2}=$

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

c) $\frac{3}{2t}$ d) $\frac{3t}{2}$

6. To which of the following Rolle's theorem can be applied?

a) $f(x)=\tan x \ in\ [0,\pi]$

b) $f(x)=\cos\left(\frac{1}{x}\right)\ in\ [-1,1]$

c) $f(x)=x^2\ in\ [2,3]$

d) $f(x)=x(x+3)\ in\ [-3,0]$

7. $\sin\theta+\sqrt{3}\cos\theta$ is maximum when

a) $\theta=60^0$ b) $\theta=30^0$

c) $\theta=45^0$ d) $\theta=90^0$

8. The slope of the tangent to the curve $y=16-x^2$ at $x=1$ is

a) 0 b) 2

c) -2 d) 15

9. The function $f(x)=\frac{x}{1+|x|}$ is

a) strictly increasing
b) strictly decreasing
c) neither increasing nor decreasing
d) not differentiable at x=0

10. The time required to reach the maximum height when a stone thrown vertically upward satisfies the equation $s=80t-16t^2$ is

a) 2 b) 2.5

c) 3 d) 0

11. The derivative of $\sin^{-1}x$ w.r.t. $\cos^{-1}\sqrt{(1-x^2)}$ is

a) $\frac{\pi}{2}$ b) $\frac{1}{1-x^2}$

c) 1 d) $\sqrt{1-x^2}$

12. The function $f(x)=\begin{cases} x,\ x\ is\ rational \\ 1-x,\ x\ is\ irrational \end{cases}$ is

a) continuous at all points
b) discontinuous at all points
c) continuous at $x=\frac{1}{2}$ only
d) discontinuous at $x=\frac{1}{2}$ only

13. If $f(x)=[x]$ is the greatest integer function, then $\lim_{x\to 1} f(x)$

a) is 0 b) is 1

c) is 2 d) does not exist

14. $\lim_{n\to\infty}\frac{1+2+3+\ldots+n}{n^2+10}$ is

a) 1/2 b) 2

c) 0 d) 1

15. The function $f(x)=\frac{x}{1+|x|}$ is differentiable in

a) $(-\infty,\infty)$ b) $(-\infty,0)$

c) $(0,\infty)$ d) $(-\infty,0)\cup(\theta,\infty)$

16. The normal to a given curve is parallel to X-axis if

a) $\frac{dy}{dx}=0$ b) $\frac{dx}{dy}=0$

c) $\frac{dy}{dx}=1$ d) $\frac{dx}{dy}=1$

17. $\int e^{\log(\sin x)}dx$ is equal to

a) $-\cos x+p$ b) $\cos x+p$

c) $\sin x+p$ d) $-\sin x+p$. p is a constant

18. $\int_2^3 [x]dx$, where $[x]$ is greatest integer function is equal to

a) 2 b) 3

c) 0 d) 4

19. $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}}\sin x\,dx$ is equal to

a) 1 b) -1

c) 2 d) 0

20. $\int_0^{\frac{\pi}{2}}\frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}}dx$ is equal to

a) 0 b) $\frac{\pi}{4}$

c) $\frac{\pi}{2}$ d) π

21. The value of $\int_0^2\int_0^3\int_0^4 dxdydz$ is

a) 2 b) 3

c) 4 d) 24

22. If $x=r\cos\theta,\ y=r\sin\theta$ then Jacobian $\frac{\partial(x,y)}{\partial(r,\theta)}$ is equal to

a) $\sin\theta$ b) $\cos\theta$

c) r d) $r^2\sin\theta\cos\theta$

23. The area of the curve $x=a\cos t, y=b\sin t$, when t varies from 0 to 2π is

a) $\pi\ ab$ b) $2\pi\ ab$

c) $4\pi\ ab$ d) 8π

24. The centre of gravity are of the curve $x=a\cos^3\theta,\ y=a\sin^3\theta$ lying in the first quadrant is at

a) (0, 0) b) (a, 0)

c) (0, a) d) $\left(\frac{2a}{5},\frac{2a}{5}\right)$

25. The order of differential equation of all circles of radius a is

a) 1 b) 2

c) 3 d) 4

26. Integrating factor of differential equation $\cos x\frac{dy}{dx}+y\sin x=1$ is

a) $\sin x$ b) $\cos x$

c) $\sec x$ d) $\tan x$

27. The differential equation $\left(x+x^8+ay^2\right)dx+\left(y^8-y+bxy\right)dy=0$ is exact if

a) $b=2a$ b) $a=b$

c) $a\neq 2b$ d) $a=2b$

Phone: 9872311001 e–mail: mathsmim@gmail.com web: www.onlinemim.com

28. P.I. of $\frac{d^2y}{dx^2}+a^2y=\sin ax$ is

a) $-\frac{x}{2a}\cos ax$ b) $\frac{x}{2a}\cos ax$

c) $-\frac{ax}{2}\cos ax$ d) $\frac{ax}{2}\cos ax$

29. The differential equation

$x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+\left(x^2-n^2\right)y=0$ is

a) Legendre's Equation
b) Bessel's Equation
c) Laguerre's Equation
d) Heat Equation

30. If $J_n(x)$ denotes Bassel function of first kind and $J_{n+1}(x)=\frac{2}{x}J_n(x)-J_0(x)$, then n is

a) 0 b) 2
c) -1 d) None of these

31. If $p_n(x)$ is Legendre polynomial of order n and $\int_{-1}^{1}p_n(x)\,dx=2$ then n is

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

32. If $\vec{a},\vec{b},\vec{c}$ are non-coplanar vectors, then the vectors $5\vec{a}+6\vec{b}+7\vec{c}$, $7\vec{a}-8\vec{b}+9\vec{c}$ and $3\vec{a}+20\vec{b}+5\vec{c}$ are

a) collinear b) coplanar
c) non-coplanar d) non-collinear

33. If $\left|\vec{a}\right|=3,\left|\vec{b}\right|=4$ and $\left|\vec{a}+\vec{b}\right|=5$, then $\left|\vec{a}-\vec{b}\right|=$

a) 8 b) 5
c) 4 d) 3

34. If θ is the angle between two unit vectors $\vec{a}$ and $\vec{b}$, then $\cos\theta$ is equal to

a)

a) $\vec{a}+\vec{b}$ b) $\vec{a}-\vec{b}$

c) $\vec{a}.\vec{b}$ d) $\left|\vec{a}\times\vec{b}\right|$

35. The unit vector perpendicular to both $\vec{l}+\vec{j}$ and $\vec{j}+\vec{k}$ is

a) $\vec{l}+\vec{k}$ b) $\vec{l}-\vec{k}$

c) $\frac{\vec{l}-\vec{j}+\vec{k}}{\sqrt{3}}$ d) $\frac{\vec{l}+\vec{j}-\vec{k}}{\sqrt{3}}$

36. The projection of the vector $\vec{l}-2\vec{j}+\vec{k}$ on the vector $4\vec{l}-4\vec{j}+7\vec{k}$ is

a) $\frac{19}{9}$ b) $\frac{9}{19}$

c) $\frac{\sqrt{6}}{19}$ d) $\frac{19}{\sqrt{6}}$

37. If $\vec{a},\vec{b},\vec{c}$ are non-zero vectors such that $\vec{a}\times\vec{b}=\vec{a}\times\vec{c}$ then

a) $\vec{a}$ and $\vec{b}$ are parallel
b) $\vec{a},\vec{b},\vec{c}$ are mutually perpendicular
c) $\vec{a},\vec{b},\vec{c}$ are coplanar
d) $\vec{b}=\vec{c}$

38. If $\left|\vec{a}+\vec{b}\right|=\left|\vec{a}-\vec{b}\right|$ then

a) $\vec{a}$ and $\vec{b}$ are perpendicular to each other
b) $\vec{a}$ is parallel to $\vec{b}$
c) $\vec{a}=\vec{0}$
d) $\vec{b}=\vec{0}$

39. If $\vec{a},\vec{b},\vec{c}$ are three non-coplanar vectors then $\left[\vec{a}+\vec{b}+\vec{c}\ \ \vec{a}-\vec{c}\ \ \vec{a}-\vec{b}\right]$ is equal to

a) $\left[\vec{a}\ \vec{b}\ \vec{c}\right]$ b) $-2\left[\vec{a}\ \vec{b}\ \vec{c}\right]$

c) $-3\left[\vec{a}\ \vec{b}\ \vec{c}\right]$ d) $-\left[\vec{a}\ \vec{b}\ \vec{c}\right]$

40. The solution set of $\left|x-2\right|\geq 3$ is

a) $[5,\infty[$ b) $]-\infty,1]$

c) $]-\infty,5]$ d) $]-\infty,1]\cup[5,\infty[$

41. The solution set of $\frac{2-3x}{5}<\frac{1-x}{3}<\frac{3+4x}{2}$ is

a) $\left]-x,\frac{1}{4}\right[$ b) $\left]\frac{1}{4},\infty\right[$

c) $\left]-\infty,\frac{1}{4}\right[$ d) $\left]-\frac{1}{4},\frac{1}{4}\right[$

42. The union of two subspaces of a vector space V is
a) always a subspace
b) never a subspace
c) a subspace if one is contained in the other
d) a subspace if and only if their intersection is $\{0\}$.

43. The dimension of the vector space C of all complex numbers over the field R of all real number is
a) 0 b) 1
c) 2 d) infinite

44. The equation of the straight line perpendicular to y=x and passing through (3, 2) is
a) $y=-x$ b) $x+y+5=0$
c) $x+y-5=0$ d) $3x+2y=0$

45. The join of (-3,2) and (4,6) is cut by the X-axis in the ratio
a) 2:3 internally b) 1:2 externally
c) 1:3 internally d) 1:3 externally

46. The distance between the lines $2x+3y-2=0$ and $2x+3y-4=0$ is

a) $\sqrt{13}$ b) $\frac{1}{\sqrt{13}}$

c) $\frac{2}{\sqrt{13}}$ d) $\frac{3}{\sqrt{13}}$

47. The angle between the lines $2x-y+3=0$ and $x+2y+3=0$ is

a) 0^0 b) $\frac{\pi}{3}$

c) $\frac{\pi}{4}$ d) $\frac{\pi}{2}$

48. The equation of the diameter of the circle $x^2+y^2-6x+2y=0$ which passes through the origin is

a) $x+3y=0$ b) $x-3y=0$

c) $x+y=0$ d) $x-y=0$

49. A circle passes through (0, 0), (a, 0) and (0, b). The co-ordinates of its centre are
a) (a, b) b) (b, a)
c) $\left(\frac{b}{2},\frac{a}{2}\right)$ d) $\left(\frac{a}{2},\frac{b}{2}\right)$

50. The number of tangents which can be drawn from the point (1, 2) to the circle $x^2+y^2=5$ are
a) 1 b) 2
c) 3 d) 0

51. The circle on focal radii of a parabola as diameter, touches the
a) axis b) directrix
c) tangent at the vertex d) None of these

52. The eccentricity of the conic $3x^2+4y^2=24$ is

a) $\frac{1}{7}$ b) $\frac{7}{4}$

c) $\frac{1}{2}$ d) $\frac{7}{2}$

53. The centre of the curve $4x^2+9y^2+16x-18y-11=0$ is
a) (-2, -1) b) (-2, 1)
c) (2, -1) d) (1,2)

54. The number of tangents to the hyperbola $\frac{x^2}{4}-\frac{y^2}{3}=1$ through (4, 1) is
a) 1 b) 2 c) 0 d) 4

55. If e, e' are the eccentricities of hyperbolas $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ and $\frac{x^2}{b^2}-\frac{y^2}{a^2}=1$ then
a) e = e' b) e = $-e'$

c) $ee'=1$ d) $\frac{1}{e^2}+\frac{1}{e'^2}=1$

56. The radius of the director circle of the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is

a) a-b b) a^2-b^2

c) $\sqrt{a^2-b^2}$ d) $\sqrt{a^2+b^2}$

57. The ratio in which the line joining (2, 4, 5), (3, 5, -9) is divided by the YZ-plane is

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

58. The direction ratios of the line which is perpendicular to the lines $\frac{x-7}{2}=\frac{y+17}{-3}=\frac{z-6}{1}$ and $\frac{x+5}{1}=\frac{y+3}{2}=\frac{z-4}{-2}$ are

a) $<4,5,7>$ b) $<4,-5,7>$
c) $<4,-5,-7>$ d) $<-4,5,7>$

59. The direction cosines of a line equally inclined to the co-ordinate axes are

a) <1, 1, 1> b) <1, 0, 0>
c) <0, 1, 0> d) $<\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}}>$

60. The distance of the point (3, 4, 5) from Y-axis is

a) 3 b) 4 c) 5 d) $\sqrt{34}$

61. The line $\frac{x-2}{1}=\frac{y-3}{2}=\frac{z-4}{0}$ is

a) parallel to X-axis
b) parallel to Y-axis
c) parallel to Z-axis
d) lies in a plane parallel to XY-plane

62. The angle between the lines x = 1, y = 2 and Y = -1, z = 0 is

a) $\frac{\pi}{2}$ b) $\frac{\pi}{3}$ c) $\frac{\pi}{6}$ d) $\frac{\pi}{4}$

63. The foot of perpendicular from (α,β,γ) on Y-axis is

a) $(\alpha,0,0)$ b) $(0,\beta,0)$
c) $(0,0,\gamma)$ d) $(0,0,0)$

64. The intercepts of the plane $2x-3y+4z=12$ on the co-ordinate axes are given by

a) 2, -3, 4 b) 6, -4, 3
c) 6, 4, -3 d) $\frac{1}{6},-\frac{1}{4},\frac{1}{3}$

65. If a line makes angles α,β,γ with the three co-ordinate axes, then $\cos 2\alpha+\cos 2\beta+\cos 2\gamma=$

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

66. Shortest distance between the lines $\vec{r}=\vec{a_1}+\lambda\vec{b}$ and $\vec{r}=\vec{a_2}+\gamma\vec{b}$

a) $\frac{|\vec{a}_1\times\vec{b}|}{|\vec{b}|}$ b) $\frac{|\vec{a}_2\times\vec{b}|}{|\vec{b}|}$

c) $\frac{|\vec{a}_1\times\vec{a_2}|}{|\vec{b}|}$ d) $\frac{|(\vec{a}_2-\vec{a}_1)\times\vec{b}|}{|\vec{b}|}$

67. The square roots of 3-4i are

a) $\pm(2-i)$ b) $\pm(2+i)$
c) $\pm(3+4i)$ d) $\pm(4-3i)$

68. If z is a non-zero complex number then the number of solutions of the equation $z^2+|z|^2=0$ is

a) 1 b) 2
c) 4 d) infinitely many

69. If $\sin x+\cos x=2$ then $\sin^4 x+\cos^4 x$ is equal to

a) 0 b)2 c) 16 d) 1

70. If $\sin A+\cos A=1$ then $\sin 2A$ is equal to

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

71. The value of $\sin^2 75^0-\sin^2 15^0$ is

a) $\frac{1}{2}$ b) $\frac{\sqrt{3}}{4}$

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

72. The general solution of $\tan 3x = 1$ is

a) $n\pi + \frac{\pi}{4}$ b) $\frac{n\pi}{3} + \frac{\pi}{12}$

c) $n\pi$ d) $n\pi \pm \frac{\pi}{4}$

73. The number of solutions of $\sin^2\theta + 3\cos\theta = 3$ in $[-\pi, \pi]$ is

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

74. If $z = xyf\left(\frac{x}{y}\right)$, then $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y} =$

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

75. If $u = x^y$ then $\frac{\partial u}{\partial x}$ is

a) 0 b) yx^{y-1}

c) $x^y \log x$ d) x^{y-1}

76. If $x = r\cos\theta$, $y = r\sin\theta$,then

a) $\frac{\partial x}{\partial r} = 1 \Big/ \frac{\partial r}{\partial x}$ b) $\frac{\partial x}{\partial r} = \frac{1}{r}\frac{\partial r}{\partial x}$

c) $\frac{\partial x}{\partial r} = \frac{\partial r}{\partial x}$ d) $\frac{\partial x}{\partial r} = 0$

77. $\frac{\partial(u,v)}{\partial(x,y)} \times \frac{\partial(x,y)}{\partial(u,v)} =$

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

78. The function $f(x,y) = |x| + |y|$ is

a) discontinuous at the origin
b) differentiable at the origin
c) continuous as well as differentiable at the origin
d) continuous but not differentiable at the origin

79. The maximum number of points of intersection of 8 straight lines is

a) 28 b) 8
c) 16 d) 56

80. The number of words which can be made out of the letter MOBILE when consonants always occupy odd places, is

a) 20 b) 36 c) 9 d) 30

81. Which one of the following statement is incorrect?

a) Every cyclic group is abelian.
b) If every element of a group is its own inverse then the group is abelian.
c) The ring of integers is not an ideal of the ring of rational numbers.
d) Every subgroup of a non-abelian group is non-abelian.

82. Which one of the following statement is correct?

a) A field has no ideals.
b) Every subgroups of an abelian group is abelian.
c) A unique factorization domain is a Euclidean domain.
d) Every maximal ideal is prime.

83. For the Euler ϕ function, $\phi(6) =$

a) 1 b) 2 c) 3 d) 4

84. If a and b are positive integer such that their H.C.F. (a, b) = 1 then $(a+b,\ a-b)$ is

a) 1 b) 2
c) either 1 or 2 d) neither 1nor 2

85. Let Q^+ be the set of rational numbers with operation '*' defined by $a * b = \frac{ab}{3}, a, b \in Q^*$.

The identity of the group $(Q^+, *)$ is

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

86. In the ring of integers, every ideal is

a) prime b) maximal
c) principal d) prime and maximal

87. If p and q stand for statements
p: it is hot,
q: it is humid then $p \wedge (\sim q)$ stands for

a) It is hot and humid.

Phone: 9872311001 e–mail: mathsmim@gmail.com web: www.onlinemim.com

b) It is humid but not hot.
c) It is hot and it is not humid.
d) It is neither hot nor humid.

88. 'Every group is isomorphic to a permutation group' is

a) Fundamental theorem of Arithmetic
b) Fundamental theorem of Algebra
c) Chinese remainder theorem
d) Cayley theorem

89. A root of the equation $x^3 - x - 4 = 0$ lies between
a) 0 and 1 b) 1 and 2
c) 2 and 3 d) 1 and 3/2

90. Newton-Raphson method fails when
a) $f(x)$ is negative
b) $f(x)$ is too large
c) $f(x)$ is zero
d) None of these

91. Which of the following method always converges?
a) Bisection b) Newton-Raphson
c) Secant Method d) Iteration Method

92. Forward difference operator Δ and shift operator E are related by
a) $\Delta = E - 1$ b) $\Delta = E + 1$
c) $\Delta = E + 2$ d) $\Delta + 2 = E$

93. The number of sub-intervals in Simpson's $\frac{3}{8}$ th rule are multiples of
a) 2 b) 3 c) 4 d) 8

94. Runge-Kutta methods are used to solve
a) Partial differential equation
b) Wave equation
c) Heat equation
d) Ordinary differential equation

95. Which of the following is not a measure of dispersion?
a) Variance b) Mean deviation
c) Mode d) Standard deviation

96. The difference between the greatest and the least value of observation is called
a) Variance b) Standard deviation
c) Mean deviation d) Range

97. The variance of the data 2, 4, 6, 8, 10 is
a) 6 b) 8 c) 10 d) 12

98. The mean deviation of the numbers 3, 4, 5, 6, 7 is
a) 0 b) 12 c) 4 d) 5

99. There are four address envelopes. The probability that all letters are not placed in the right envelopes is
a) $\frac{1}{4}$ b) $\frac{3}{4}$ c) $\frac{23}{24}$ d) $\frac{1}{24}$

100. Four coins are tossed. The chance that there should be two tails is
a) $\frac{1}{8}$ b) $\frac{1}{4}$ c) $\frac{3}{8}$ d) $\frac{1}{16}$

101. The probability of three mutually exclusive events A, B, C are $\frac{2}{3}, \frac{1}{4}, \frac{1}{6}$ respectively, is the statement
a) true b) wrong
c) could be either d) do not know

102. If the mean of a Binomial distribution is 20 and standard deviation is 4, then number of events is
a) 25 b) 50 c) 75 d) 100

103. A speaks truth in 60 percent cases and B speaks truth in 70 percent cases. The probability that they will say the same thing while describing a single event is
a) 0.38 b) 0.42 c) 0.12 d) 0.54

104. In a non-leap year, the probability of getting 53 Sundays or 53 Tuesdays or 53 Thursdays is
a) $\frac{1}{7}$ b) $\frac{2}{7}$ c) $\frac{3}{7}$ d) $\frac{4}{7}$

105. A problem in mathematics is given to 3 students whose chances of solving it individually are $\frac{1}{2}, \frac{1}{3}$

and $\frac{1}{4}$. The probability that the problem will be solved at least by one is

a) $\frac{1}{4}$ b) $\frac{1}{3}$ c) $\frac{3}{4}$ d) $\frac{11}{12}$

106. With the symbols having their usual meanings, the standard deviation of the Binomial distribution is

a) $\sqrt{npq}$ b) $\sqrt{n}\,p$
c) npq d) pq

107. Which one of the following is true?
a) If the mean of a Poisson distribution is 5 then its variance is 10.
b) The mean of a Binomial distribution is 5 and standard deviation is 3.
c) The mean and variance of Poisson distribution are equal.
d) Skewness indicates peakedness of the frequency distribution.

108. Which of the following statement is correct?
a) Every linear programming problem (L.P.P.) admits an optimal solution.
b) A L.P.P. admits a unique solution.
c) If a L.P.P. admits two optimal solutions, then it has an infinite numbers of optimal solutions.
d) A L.P.P. always admits two optimal solutions.

109. Maximum or minimum of the objective function subject to given constraints, occurs only at the boundary or the corner points of the feasible region'. This theorem is known as Fundamental Theorem of
a) Algebra b) Arithmetic
c) Calculus d) Extreme points

110. A weight W hangs by a string and is drawn aside by a horizontal force until the string makes an angle of 60^0 with the vertical. Then the horizontal force and the tension in the string are
a) $\sqrt{3}W, W$ b) $\sqrt{3}W, 2W$
c) $2W, W$ d) $3W, W$

111. The parallel forces not having the same line of action from a couple if they are
a) like and unequal
b) like and equal
c) equal and unlike
d) unequal and unlike

112. A particle is in equilibrium under three forces. Two of the forces act at right angles to one another, one being double the other. The third force has a magnitude of 10 Newtons. The magnitude of the other two(in Newton) is
a) $2\sqrt{5},\ 4\sqrt{5}$ b) 2, 3
c) $2\sqrt{5},\ 3\sqrt{5}$ d) $2\sqrt{3},\ 2\sqrt{5}$

113. The resultant of non-parallel forces and a couple in a plane always reduces to
a) a single force b) a couple
c) two forces d) None of these

114. A body is in equilibrium under the action of three coplanar forces, then
a) They must act in a straight line
b) They must meet in a point
c) Their horizontal and vertical components are equal
d) They must either meet in a point or be parallel

115. If the resultant of two forces 2P and $\sqrt{2}P$ is $\sqrt{10}P$, then the angle between them will be
a) π b) $\frac{\pi}{4}$ c) $\frac{\pi}{3}$ d) $\frac{\pi}{2}$

116. A particle starts with a velocity of 100 cm/sec and moves with a uniform retardation of $2cm/sec^2$. Its velocity will be zero after
a) 25 seconds b) 50 seconds
c) 100 seconds d) 2 seconds

117. Maximum range for a given particle is possible only when angle of projection is
a) $\frac{\pi}{3}$ b) $\frac{\pi}{4}$ c) $\frac{\pi}{6}$ d) $\frac{\pi}{2}$

118. A constant force acting on a body of mass 20g produces in it a velocity of 27 cm/sec in 6 seconds. If the body starts from rest, the magnitude of the force in Dynes is

a) 90 b) 50 c) 60 d) 80

119. Let A and B be 3×3 matrices such that AB = 0. Then
a) A = 0 and B = 0
b) A = 0 or B = 0
c) $|A|=0$ and $|B|=0$
d) Either $|A|=0$ or $|B|=0$

120. The system of equations $\begin{matrix} x+2y=11 \\ -2x-4y=22 \end{matrix}$ has
a) only one solution
b) finitely many solutions
c) no solution
d) infinitely many solutions

121. If A is a skew symmetric matrix the $|A|=$
a) 1 b) -1 c) 0 d) 2

122. For a 3×3 matrix A, if $|A|=4$ then $|\text{Adj } A|=$
a) -4 b) 4 c) 64 d) 16

123. If AB = A and BA = B then B^2 is equal to
a) 1 b) 0 c) A d) B

124. If A is an orthogonal matrix then $|A|=$
a) 0 b) 1
c) -1 d) either 1 or -1

125. Rank of unit matrix of order 4 is
a) 0 b) 1 c) 4 d) 3

126. Which one of the following statement is true?
a) If rank A = 2 and rank B = 3 then rank (AB) = 6.
b) Every square matrix does not satisfy its characteristic equation.
c) If λ is an eigen value of an orthogonal matrix then $\frac{1}{\lambda}$ is also its eigen value.
d) The eigen values of a skew symmetric matrix are all real.

127. If A and B are square matrices of order 3 such that $|A|=-1,\ |B|=-3$ then $|3AB|=$
a) -9 b) -81 c) -27 d) 81

128. If a matrix A is symmetric as well as skew symmetric then A is a
a) diagonal matrix b) zero matrix
c) unit matrix d) triangular matrix

129. The set $\{x : x \text{ is integer, } x^2=4 \text{ and } 2x=6\}$ is equal to
a) $\{2,3\}$ b) $\{-2,3\}$
c) $\{2,-2,3\}$ d) ϕ

130. If $A=\{x : x \text{ is real, } |x|<1\}$.
$B=\{x : x \text{ is real, } |x-1|\geq1\}$ then $A\cap B$ is equal to
a) $]-1,0]$ b) $[-1,2]$
c) $]-1,2]$ d) $]-1,2[$

131. If A and B are two sets such that $A\cup B=A\cap B$ then
a) $A\subseteq B$ b) $B\subseteq A$
c) $A=B$ d) None of these

132. In a class of 100 students, 55 students have passed in Mathematics and 67 students have passed in Chemistry. Then the number of students who have passed in Chemistry only is
a) 22 b) 33 c) 10 d) 45

133. If a, b, c are in G.P., then $\log_a x$, $\log_b x$, $\log_c x$ are in
a) A.P. b) G.P.
c) H.P. d) None of these

134. If $|x|<1$ and $y=x-x^2+x^3-x^4+....$ then the value of x is
a) y b) 1/y
c) y-1/y d) y(1-y)

135. The next term of the series $\frac{3}{2}+\frac{5}{4}+\frac{9}{8}+\frac{17}{16}+.....$ is
a) $\frac{25}{32}$ b) $\frac{33}{32}$ c) $\frac{29}{32}$ d) $\frac{37}{32}$

136. Sum of n terms of the series
$\sqrt{2}+\sqrt{8}+\sqrt{18}+\sqrt{32}+.....$ is

a) $\frac{n(n+1)}{2}$ b) $\frac{n(n+1)}{\sqrt{2}}$

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

137. If P,Q,R are the A.M., G.M.,H.M. respectively between any two rational numbers a and b, then P-Q is

a) $\frac{\sqrt{a}-\sqrt{b}}{2}$ b) $\frac{\sqrt{a}+\sqrt{b}}{2}$

c) $\frac{\sqrt{a}+\sqrt{b}}{\sqrt{2}}$ d) $\frac{\left(\sqrt{a}-\sqrt{b}\right)^2}{2}$

138. If the sum of the first n terms of a series is $5n^2+2n$, then its second term is

a) 17 b) 16 c) 24 d) 7

139. Infimum of the set of all positive even integers is

a) 0 b) 2 c) 1 d) ∞

140. Set $\left\{\frac{1}{n}: n=1,2,...\right\}$ is

a) closed
b) open
c) open but not closed
d) neither open nor closed

141. Which one of the following set is countable?

a) The set of irrational numbers
b) The set of real numbers
c) The set of prime numbers
d) The set of transcendental numbers

142. The sequences $<(-1)^n / n : n$ is a natural number$>$ is

a) convergent b) divergent
c) oscillatory d) None of these

143. The series $1+r+r^2+....$ is oscillatory only if

a) $r<1$ b) $r\le 0$
c) $r=-1$ d) $r<0$

144. The term independent of x in the expansion of $\left(x-\frac{1}{x}\right)^{10}$ is

a) 1st term b) 5th term
c) 6th term d) 11th term

145. The sum of the coefficients in the expansion of $(1-x)^{10}$ is

a) 0 b) 2^{10} c) 10^2 d) 10

146. If A and B are the coefficients of x^r and x^{n-r} in the expansion of $(1+x)^n$, then

a) A+B = 0 b) A-B = 0
c) $A \neq B$ d) None of these

147. The closed and bounded interval [a,b] is compact follows from

a) Bolzano Weistrass theorem
b) Cayley Hamilton
c) Bionomial theorem
d) Heine Borel theorem

148. If n is a positive integer, then the number of terms in the expansion of $(x+a)^n$ is

a) n b) n+1
c) n-1 d) n+2

149. The function $f(x)=\frac{|x|}{x}, x\neq 0$ is continuous at x = 0 if

a) $f(0)=0$
b) $f(0)=1$
c) $f(0)=-1$
d) can't be continuous for any value of f(0)

150. The function $f(x)=\frac{1}{x}$ is

a) Not continuous in $]0,1]$
b) Uniformly continuous on $]0,1]$
c) Continuous in $[0,1]$
d) Not uniformly continuous on $]0,1]$

Phone: 9872311001 e–mail: mathsmim@gmail.com web: www.onlinemim.com