Registration No.: 11706027

Paper Code: A

PNR No:: 117181MTH55253

COURSE CODE : MTH165
COURSE TITLE : MATHEMATICS FOR ENGINEERS

Time Allowed: 02:00 hrs **Max.Marks: 70**

Read the following instructions carefully before attempting the question paper.
1. Match the Paper Code shaded on the OMR Sheet with the Paper code mentioned on the question paper and ensure that both are the same.
2. This question paper contains 70 questions of 1 mark each. 0.25 marks will be deducted for each wrong answer.
3. Do not write or mark anything on the question paper except your registration no. on the designated space.
4. Submit the question paper and the rough sheet(s) along with the OMR sheet to the invigilator before leaving the examination hall.

Q1. A matrix $A = (a_{ij})_{m\times n}$ is said to be a square matrix if
a) $m = n$ b) $m \leq n$ c) $m \geq n$ d) $m < n$

Q2. In an upper triangular matrix $A = (a_{ij})_{n\times n}$, the element $a_{ij} = 0$ for
a) $i < j$ b) $i > j$ c) $i = j$ d) $i \leq j$

Q3. If A and B are two matrices, then
a) AB=BA b) AB cannot necessarily be defined c) AB=0 d) AB=I

Q4. The value of the determinant $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix}$ is
a) $a+b+c$ b) 0 c) 1 d) abc

Q5. If A is of order 2×3 and B is of order 3×2, then AB is of order
a) 2×3 b) 3×3 c) 2×2 d) 3×2

Q6. If A and B are square matrices of order 3 such that $|A| = -1, |B| = 3$, then the determinant of 3AB is
a) -9 b) -27 c) -81 d) 81

Q7. If $y = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + - - - + \infty$, then $\frac{dy}{dx}$ is equal to
a) $-y$ b) $\frac{1}{y}$ c) y d) none of these

Q8. If $y = n^x, n > 0$ then $\frac{dy}{dx}$ is equal to
a) xn^{x-1} b) $\frac{x}{\log n}$ c) $n^x \log n$ d) none of these

Q9. The derivative of $(3x^2+2)^2$ is
a) $12x(3x^2+2)$ b) $12(3x^2+2)$ c) $x(3x^2+2)$ d) $12x(3x^2+2)^2$

Q10. If $y = \log[(x+2)(x^3-x)]$ then $\frac{dy}{dx}$ is
a) $(x+2)+(x^3-x)$ b) $\frac{1}{x+2}+\frac{3x^2-1}{x^3-x}$ c) $\frac{1}{x+2}+\frac{3x^2}{x^3-x}$ d) $\frac{3x^2-1}{x^3-x}$

Q11. If $y = a^5$, then $\frac{dy}{dx}$ is equal to
a) $5a^4$ b) $a^5 \log a$ c) $\frac{a^5}{\log a}$ d) 0

Q12. If $x = 2at, y = at^2$, then $\frac{dy}{dx}$ is equal to
a) 2 b) $2a$ c) $2at$ d) t

Q13. Which of the following is an "even" function of t?
(a) t^2 (b) $t^2 - 4t$ (c) $\sin 2t + 3t$ (d) $t^3 + 6$

Q14. A "periodic function" is given by function which
a) has a period $T = 2\pi$ b) satisfies $f(t+T) = f(t)$
c) satisfies $f(t+T) = -f(t)$ d) has a period $T = \pi$

Q15. Given the periodic function $f(x) = \begin{cases} -x, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$, then the value of the fourier coefficient b_n can be computed as
(a) $\frac{(-1)^n}{n\pi}$ (b) $\frac{1}{n\pi}$ (c) 0 (d) none of these

Q16. For Fourier series expansion of periodic function $f(x)$ defined in $(-1,1)$ .if $f(x)$ is an even function then,
(a) $a_n = 0$ (b) $b_n = 0$ (c) $a_0 = 0$ (d) both a_0 and a_n is zero

Q17. Fourier series of the periodic function with period 2π defined by

$f(x) = \begin{cases} 0, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$ is $\frac{\pi}{4} + \sum\left[\frac{1}{\pi n^2}(\cos n\pi - 1)\cos nx - \frac{1}{n}\cos n\pi \sin nx\right]$.

But putting $x = \pi$, we get the sum of the series $1 + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$ is

(a) $\frac{\pi^2}{4}$ (b) $\frac{\pi^2}{6}$ (c) $\frac{\pi^2}{8}$ (d) $\frac{\pi^2}{12}$

Q18. The value of Cos $2n\pi$, if n is positive integer is

(a) -1 (b) 0 (c) 1 (d) π

Q19. If $u = y^x$, the values of $\frac{\partial u}{\partial x}, \frac{\partial u}{\partial y}$ are:

(a) $yx^{y-1}, x^y \log x$ (b) $y^x \log y, xy^{x-1}$ (c) $xy^{x-1}, x^y \log x$ (d) $yx^{y-1}, y^x \log y$

Q20. If $f = \log(x \tan^{-1} y)$, then f_{xy} is equal to

(a) $\frac{-1}{x^2}$ (b) 0 (c) $\frac{1}{x^2}$ (d) none of these

Q21. If $f(x,y) = \sin x + \cos y + xy^2, x = \cos t, y = \sin t$, then $\frac{df}{dt}$ at $t = \frac{\pi}{2}$ is

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

Q22. If $z = e^{\left(\frac{x^2+y^2}{x+y}\right)}$, then $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y} =$

(a) 0 (b) $z^2 \ln z$ (c) $z \ln z$ (d) z

Q23. If $u = f(r,s), r = \frac{x}{y}, s = \frac{y}{x}$ then $xu_x + yu_y$ is

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

Q24. If $x^2y + xz + z^2 = 4$, then $\frac{\partial z}{\partial x} =$

(a) $-\left(\frac{2xy+x}{3z}\right)$ (b) $-\left(\frac{x+2z}{2xy+z}\right)$ (c) $-\left(\frac{2xy+z}{x+2z}\right)$ (d) $2xy + z$

Q25. Critical point of $f(x,y) = 2x^2 + 2xy + 2y^2 - 6x$ is

(a) $(1,2)$ (b) $(0,1)$ (c) $(-2,3)$ (d) $(2,-1)$

Q26. No. of critical points for $f(x,y) = 4 + x^3 + y^3 - 3xy$ are

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

Q27. Nature of (1, 1) for $f(x,y) = 2x^2 - 4xy + y^4 + 2$ is

(a) relative minima (b) relative maxima (c) saddle point (d) none of these

Q28. If $z = f(u,v), u = x^2y, v = 3x + 2y$, then $\frac{\partial z}{\partial y} =$

(a) $x^2\frac{\partial z}{\partial u} + 2\frac{\partial z}{\partial v}$ (b) $2xy\frac{\partial z}{\partial u} + 2\frac{\partial z}{\partial v}$ (c) $x^2\frac{\partial u}{\partial z} + 3\frac{\partial v}{\partial x}$ (d) $2xy\frac{\partial u}{\partial z} + 2\frac{\partial v}{\partial z}$

Q29. $\lim_{(x,y)\to(0,0)} \frac{x}{\sqrt{x^2+y^2}} =$

(a) 1 (b) -1 (c) 0 (d) does not exist

Q30. Value of α, for which $f(x,y) = \begin{cases} \frac{x^2+xy+x+y}{x+y}, & (x,y) \neq (2,2) \\ \alpha, & (x,y) = (2,2) \end{cases}$ is continuous at (2, 2), is

(a) 0 (b) 4 (c) 3 (d) No such α exist

Q31. $\lim_{(x,y)\to(0,0)} \frac{y^2x^4}{(x^4+y^2)^2}$ does not exist along the path

(a) $y^3 = mx$ (b) $y^2 = mx$ (c) $y = mx$ (d) $y = mx^2$

Q32. If $x = u(1+v), y = v(1+u)$, then $\frac{\partial(x,y)}{\partial(u,v)} =$

(a) $2uv$ (b) $1 - u - v$ (c) $1 + u + v$ (d) 1

Q33. $\lim_{(x,y)\to(0,0)} \frac{y^3x}{(x^2+y^6)} =$

(a) 0 (b) -1 (c) Does not exist (d) None of these.

Q34. Which of the following is homogeneous?

(a) $\frac{x^3-xy^2}{x-1}$ (b) $\tan\left(\frac{x^3}{x^2+y^2}\right)$ (c) $\log\left[\frac{x^2-y^2}{x^2+y^2}\right]$ (d) $\frac{x^2-y}{x-y}$

Q35. $\lim_{(x,y)\to(0,0)} \frac{x+y}{x^2+y^2+1} =$

(a) 1 (b) 0 (c) -1 (d) does not exist

Q36. Evaluate $\int_{x=0}^{x=2}\int_{y=0}^{y=1} dxdy$

a. 0 b. 2 c. 3 d. 4

Q37. Area of the region bounded by $0 \le x \le 1,\ 0 \le y \le x$

a. 1 b) 1/2 c) 1/4 d) None of these

Q38. Evaluate $\int_{x=0}^{x=2}\int_{y=0}^{y=2}\int_{z=0}^{z=2} dz\,dxdy$

a. 6 b. 8 c. 2 d. 1

Q39. Evaluate $\int_{x=0}^{x=1}\int_{y=0}^{y=2}\int_{z=0}^{3} 3dz\,dxdy$

a. 6 b. 18 c. 10 d. 15

Q40. Find area enclosed by $x^2+y^2=1$

a. 5π b. π c. 3π d. 4π

Q41. Find volume of $x^2+y^2+z^2=1, x\ge 0, y\ge 0, z\ge 0$

a. $4\pi/3$ b. $2/3\pi$ c. $3\pi/2$ d. $\pi/3$

Q42. Which of the following is correct?

a) $\iint dxdy = \iint rdrd\theta$ b) $\iint dxdy = \iint 2rdrd\theta$ c) $\iint dxdy = \iint r^2drd\theta$ d) $\iint dxdy = \iint rcos\theta drd\theta$

Q43. Change the order of $\int_{y=-4}^{y=1}\int_{x=0}^{x=y+4} dxdy$

a) $\int_{x=0}^{x=5}\int_{y=x-4}^{y=5} dxdy$ b) $\int_{x=0}^{x=5}\int_{y=x}^{y=1} dxdy$ c) $\int_{x=0}^{x=5}\int_{y=x+4}^{y=1} dxdy$ d) $\int_{x=0}^{x=5}\int_{y=x-4}^{y=1} dxdy$

Q44. Volume bounded by $x^2+y^2=4$ and $y+z=4, z=0$ is given by

a) $\int_{y=0}^{y=2}\int_{x=-\sqrt{4-y^2}}^{x=\sqrt{4-y^2}}\int_{z=0}^{4-y} dz\,dxdy$ b) $\int_{y=-2}^{y=2}\int_{x=-\sqrt{4-y^2}}^{x=\sqrt{4-y^2}}\int_{z=0}^{4-y} dz\,dxdy$

c) $\int_{y=-1}^{y=1}\int_{x=-\sqrt{4-y^2}}^{x=\sqrt{4-y^2}}\int_{z=0}^{4+y} dz\,dxdy$ d) None of these

Q45. To find area bounded between $y^2=4x$ and $x^2=4y$, which of the following is correct?

a) $\int_{x=0}^{x=1}\int_{y=x^2/4}^{y=2\sqrt{x}} dxdy$ b) $\int_{x=0}^{x=4a}\int_{y=x^2/4}^{y=2\sqrt{x}} dxdy$ c) $\int_{x=0}^{x=4}\int_{y=x^2/4a}^{y=2\sqrt{ax}} dxdy$ d) None of these

Q46. Area bounded by the circles $x^2+y^2=4$ and $x^2+y^2=1$ is

a. π b. 5π c. 2π d. 3π

Q47. The value of $\int_1^e\int_1^e\int_1^e \frac{1}{xyz}\,dxdydz$ is

a. 0 b. 1/3 c. 1 d. None of these

Q48. Evaluate $\int_{x=0}^{x=1}\int_{y=0}^{y=2} 5dxdy$

a. 0 b. 1 c. 3 d. 10

Q49. Evaluate $\int_{x=0}^{x=2}\int_{y=0}^{y=x} dxdy$

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

Q50. Which of the following is correct

a) $\iiint dxdydz = \iiint sin\theta\, drd\theta d\emptyset$ b) $\iiint dxdydz = \iiint r^2 sin\theta\, drd\theta d\emptyset$

c) $\iiint dxdydz = \iiint rsin\theta\, drd\theta d\emptyset$ d) None of these

Q51. The integral $\int_{x=0}^{x=\infty}\int_{y=0}^{y=\infty} e^{(x^2+y^2)}dxdy$, into polar coordinates is equal to

a) $\int_{\theta=0}^{\pi/2}\int_{r=0}^{1} drd\theta$ b) $\int_{\theta=0}^{\pi/2}\int_{r=0}^{\infty} e^{r^2} rdrd\theta$ c) $\int_{\theta=0}^{\pi}\int_{r=0}^{\infty} e^{-r^2} drd\theta$ d) $\int_{\theta=0}^{\pi/2}\int_{r=0}^{\infty} rdrd\theta$

Q52. To evaluate $\iint f(x,y)dxdy$ over the area between $y=x^2$ and $y=x$, which of the following is correct:

a) $\int_{x=0}^{x=1}\int_{y=x^2}^{y=1} f(x,y)dxdy$ b) $\int_{x=0}^{x=1}\int_{y=x^2}^{y=x} f(x,y)dxdy$ c) $\int_{x=0}^{x=1}\int_{y=0}^{y=x} f(x,y)dxdy$ d) $\int_{x=0}^{x=1}\int_{y=0}^{y=1} f(x,y)dxdy$

Q53. In linear programming, objective function and constraints are

(a) Linear (b) Quadratic (c) Bi-quadratic (d) None of these

Q54. In maximization problem, optimal solution occurring at corner point yields the

(a) Average values of objective function (b) Highest value of objective function

(c) Lowest value of objective function (d) None of these

Q55. Graphical method to solve a LPP is applicable, only if LPP involves

(a) Four decision variables (b) Three decision variables

(c) Two decision variables (d) One decision variable

Q56. Which of the following is a valid objective function for the linear programming problem?

(a) $Max\ Z = 2x - y - 3z$ (b) $Max\ Z = 7xy + 3y$

(c) $Max\ Z - x^3 + y^3 + z^3$ (d) $Max\ Z = xy/z$

Q57. The optimal point of the LPP $Max\ Z = 6x + 11y$ subjected to $2x + y \le 104, x + 2y \le 76, x, y \ge 0$ is

(a) $x = 44, y = 16$ (b) $x = 0, y = 38$ (c) $x = 52, y = 0$ (d) $x = 80, y = 40$

Q58. Which of the following is not a corner point for the common region represented by the constraints $5x + 3y \geq 45, x \leq 8, y \leq 10$

(a) $(8, 5/3)$ (b) $(8, 10)$ (c) $(3, 10)$ (d) $(1, 10)$

Q59. For the LPP $Max\ Z = 22x + 18y$ subjected to $3x + 2y \leq 48, x + y \leq 20, x, y \geq 0$, maximum value of Z is

(a) 352 (b) 392 (c) 360 (d) 0

Q60. Feasible solution of linear programming problem satisfies

(a) All constraints simultaneously

(b) All constraints as well as the condition of non-negativity for decision variables

(c) Only the condition of non-negativity for decision variables

(d) None of these

Q61. The total number of basic solution of the system of equations $2x + y + 4z + w = 11, 3x + y + 5z + 7w = 14$ a

(a) 6 (b) 5 (c) 4 (d) 3

Q62. If there are two equations consisting five variables, then how many non-basic variables are to be considered to find basic solution of the system

(a) 2 (b) 3 (c) 4 (d) 6

Q63. In case of LPP, the inequalities of the constraints of the type $\sum_{j=1}^{n} a_{ij}x_j \leq b_i (i = 1,2, \dots, k)$ can be converted to equalities by adding which variables

(a) surplus variables (b) artificial variable (c) decision variable (d) slack variable

Q64. Standard form of the LPP

$Max\ Z = 3x + 5y + 7z$ sub to $6x - 4y \leq 5, 3x + 2y + 5z \geq 11, 4x + 3z \leq 2,\ x, y, z \geq 0$ is

(a) $Max\ Z = 3x + 5y + 7z$

sub to $6x - 4y + s_1 = 5,$

$3x + 2y + 5z - s_2 = 11,$

$4x + 3z + s_3 = 2$

where $x, y, z, s_1, s_2, s_3 \leq 0$

(b) $Max\ Z = 3x + 5y + 7z$

sub to $6x - 4y = 5,$

$3x + 2y + 5z = 11,$

$4x + 3z - 2$

where $x, y, z \geq 0$

(c) $Max\ Z = 3x \mid 5y \mid 7z$

sub to $6x - 4y + s_1 = 5,$

$3x + 2y + 5z - s_2 = 11,$

$4x + 3z + s_3 = 2$

where $x, y, z, s_1, s_2, s_3 \geq 0$

(d) $Max\ Z = 3x \quad 5y \quad 7z$

sub to $6x - 4y + s_1 = 5,$

$3x + 2y + 5z - s_2 = 11,$

$4x + 3z + s_3 = 2$

where $x, y, z, s_1, s_2, s_3 \geq 0$

Q65. In simplex method, optimal basic feasible solution is obtained if

$c_j \rightarrow$			5	3	0	0	0
$\downarrow$	Basic Variables	Basic Solution	x_1	x_2	s_1	s_2	s_3
0	s_1	2	1	1	1	0	0
0	s_2	12	5	2	0	1	0
0	s_3	12	3	8	0	0	1

(a) $c_j - z_j \leq 0$ (b) $c_j - z_j \geq 0$ (c) $c_j - z_j - 0$ (d) none of these

Q66. In the simplex method, for the problem of maximization the entering variable in the below given table is

(a) x_1 (b) s_2 (c) x_2 (d) s_1

Q67. The optimal solution of the LPP $Max\ Z = x + 2y$ sub to $x + y \leq 1$, where $x, y \geq 0$ is

(a) 2 (b) 1 (c) 0 (d) 4

Q68. In the simplex method, slack variables are introduced in the objective functions with coefficients as

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

Q69. In the linear programming problem to convert unrestricted variable (x_i say) to restricted variable we assume

(a) $x_i = x_i' + x_i''$, where $x_i', x_i'' \geq 0$ (b) $x_i = x_i' - x_i''$, where $x_i', x_i'' \geq 0$

(c) $x_i = 0$ (d) none of these

Q70. In the standard form of an LPP, the constraints must be

(a) "$\leq$" Type (b) "$\geq$" Type (c) "=" Type (d) All of the above

-- End of Question Paper --