Registration No.: 18 OCT

23241MTH20497
Paper Code: A

Course Code:MTH174
Course Title:ENGINEERING MATHEMATICS

Time Allowed: 01:30hrs. **Max Marks: 30**

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 30 questions of 1 mark each. 0.25 marks will be deducted for each wrong answer.*
3. *All questions are compulsory.*
4. *Do not write or mark anything on the question paper and/or on rough sheet(s) which could be helpful to any student in copying, except your registration number on the designated space.*
5. *Submit the question paper and the rough sheet(s) along with the OMR sheet to the invigilator before leaving the examination hall.*

Q(1) Let $A_{3\times3}$ be a non-singular matrix. Then the rank of the matrix A is

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

CO1,L1

Q(2) Consider the following statements for the matrix $M = \begin{pmatrix} 1 & 2 & -1 \\ -1 & 1 & 1 \\ 0 & 3 & 0 \end{pmatrix}$.

(A) Assertion: The rank of the matrix is 2.
(B) Reason: The determinant of the matrix is 0

Choose the correct option.

(a) Both (A) and (B) are true. (b) (A) is false but (B) is true. (c) (A) is true but (B) is false. (d) Both (A) and (B) are false.

CO1,L1

Q(3) Let (A) be a skew symmetric matrix of order 5 × 5. Then which of the following can never be the rank of the matrix A.

(a) 3 (b) 2 (c) 5 (d) 1

CO1,L1

Q(4) Let A be a matrix of order $m \times n$. Then which of the following is correct.

(a) $\rho(A) = m$ (b) $\rho(A) < min\{m,n\}$ (c) $\rho(A) = min\{m,n\}$ (d) $\rho(A) \leq min\{m,n\}$

CO1,L1

Q(5) The system of equations given by $AX = O$ can never have

(a) a unique solution. (b) infinite number of solutions
(c) no solution (d) None of above.

CO1,L1

Q(6) Consider the system of equations $AX = O$. Then which of the following is correct.

(a) If $|A| \neq 0$, then $X = O$ is the only solution. (b) If $|A| = 0$, then the system has infinite number of solutions.
(c) The system is always consistent. (d) All of the above.

CO1,L1

Q(7) if $A=\begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 1 \\ 0 & 0 & 3 \end{bmatrix}$ then its eigen values are .

a) 1,2,3 b)0,2,1 c)0,0,3 d) None of these

CO1,L1

Q(8) If two eigen values of a matrix of order 3x3, whose trase is 11 are 2&4, then the third eigen value is

a) 5 b) 4 c) 3 d) None of these

CO1,L1

Q(9) Let A be an invertible matrix of order n. Then choose the correct option.

(a) The rank of A is $< n$. (b) 0 can never be an eigen value of A.
(c) 0 is an eigen value of A. (d) None of the above.

CO1,L1

Q(10) Let $A = \begin{pmatrix} 1 & 2 \\ -3 & 1 \end{pmatrix}$ be a matrix. Then choose the correct option.

(a) $A^2 + 2A + 7I = 0$ (b) $A^2 - 2A + 7 = 0$ (c) $A^2 - 2A + 7I = 0$ (d) None of the above.

CO1,L1

Q(11) If A: $y''' + 3y'' + 12y = x^2$, B: $x^3y'' + xy' - y = 0$, C: $y'' - a^2y = 0$

Which of these represents differential equation with constant coefficient?

(a) Only A (b) Only C (c) Only A and C (d) A,B and C

CO2,L2

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Q(12) In which interval the differential equation $y''' + 9y' + y = \ln(9 - x^2)$ is normal?

(a) Any subinterval on $(-\infty, \infty)$ (b) Any subinterval on $(-3, 3)$

(c) Any subinterval on $(3, \infty)$ (d) Any subinterval on $(-\infty, -3) \cup (3, \infty)$

Q(13) The linear independent solution of the differential equation $y'' + 2y' + 5y = 0$ are

(a) $e^x \cos 2x, e^x \sin 2x$ (b) $e^{-x} \cos 2x, e^{-x} \sin 2x$ (c) $e^{-x} \cos x, e^{-x} \sin x$ (d) $e^{-2x} \cos x, e^{-2x} \sin x$

Q(14) The differential equation of the form $y'' + a(x)y' + b(x)y = 0$ for which the functions e^{3x}, e^{-2x} are solutions is

(a) $y'' + 5y' + 6y = 0$ (b) $y'' + y - 6y = 0$ (c) $y'' + y' + 6y = 0$ (d) $y'' - y' - 6y = 0$

Q(15) The general solution of the differential equation $y'' + 25y = 0$ is

(a) $\cos 5x + \sin 5x$ (b) $2\cos 5x + 3\sin 5x$

(c) $\sin 5x - \cos 5x$ (d) $A \cos 5x + B \sin 5x$, A and B are arbitrary constants

Q(16) Consider the second order differential equation $y'' + ay' + by = 0$, where a and b are real constants. If $y = x\,e^{-2x}$ be one of the solutions of the differential equation then

(a) Both a and b are positive (b) b is positive but a is negative
(c) a is positive but b is negative (d) both a and b are negative

Q(17) The linear independent solution of the differential equations
(a) e^{2x}, e^{-3x} (b) e^{-2x}, e^{3x} (c) e^{2x}, e^{3x} (d) None of these

Q(18) The general solution of the differential equation $y^{iv} - 3y''' + 3y'' - y' = 0$ is
(a) $(c_1 + c_2x + c_3x^2 + c_4x^3)e^x$ (b) $(c_1 + c_2x)e^x + c_3e^{3x} + c_4$
(c) $c_1 + c_2e^x + c_3e^{2x} + c_4e^{3x}$ (d) $(c_1 + c_2x + c_3x^2)e^x + c_4$

Q(19) The homogenous differential equation with constant coefficient of lowest order which has the function $\{1 + x + 3e^x - 5e^{3x}\}$ as a particular solution
(a) $y^{iv} - 3y''' + 3y'' - y' = 0$ (b) $y^{iv} - 4y''' + 3y'' = 0$
(c) $y^{iv} - 11y''' + 35y'' - 25y' = 0$ (d) $y^{iv} + 4y''' + 3y'' + y' = 0$

Q(20) If $\{e^x, e^{4x}\}$ form the basis of the equation $y'' - 5y' + 4y = 0$, $y(0) = 2$, $y'(0) = 1$, then the solution is

(a) $\frac{e^x - 7e^{4x}}{3}$ (b) $\frac{4e^{4x} - e^x}{3}$ (c) $\frac{e^{4x} + 7e^x}{3}$ (d) $\frac{7e^x - e^{4x}}{3}$

Q(21) What is correct form for y_p for $y'' + 4y = 4e^{2x}$, when we use undetermined co-efficient method?
(a) Ae^x (b) Ae^{2x} (c) e^{2x} (d) $4e^{2x}$

Q(22) Which of the following is correct choice of y_p for $y'' + 10y' + 25y = e^{-5x}$?
(a) Be^{-5x} (b) Ae^{5x} (c) xe^{-5x} (d) None of the above

Q(23) What is the correct form for y_p for $y'' - 2y' + y = e^x + x$, when we use undetermined co-efficient method?
(a) $Ae^x + Bx + C$ (b) $Axe^x + Bx + C$ (c) $x(Ae^x + Bx + C)$ (d) None of the above

Q(24) Which method can be used to find complete solution of $y'' + a^2y = \tan(ax)$?
(a) Method of undetermined coefficient (b) operator method
(c) Variation of parameter (d) None of the above

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) What is wronskian of 1, e^x?

(b) $1+e^x$ (c) e^x (d) None of the above

CO1,L2

6) The solution $y_1(x)$ & $y_2(x)$ are said to be L.I. if .....

$W(y_1, y_2) = 1$ (b) $W(y_1, y_2) = 0$ (c) $W(y_1, y_2) \neq 0$ (d) None of the above

CO2,L2

27) Solution of $x^2y'' - 2.5xy' - 2y = 0$ is .....

$c_1x^{-4} + c_2\frac{1}{x}$ (b) $c_1x^4 + c_2\frac{1}{\sqrt{x}}$ (c) $c_1e^{4x} + c_2\frac{1}{e^x}$ (d) None of the above

CO2,L2

28) The solution of differential equation $x^2\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = 0$ will be _____, where c_1 and c_2 are arbitrary constants.

(a) $y = c_1x + c_2x^2$ (b) $y = c_1 \log x + c_2x$ (c) $y = c_1 + c_2x$ (d) $y = c_1x^2 + c_2x^3$

CO3,L2

Q(29) For $\frac{d^2y}{dx^2} + 4y = \tan 2x$ solving by variation of parameters. The value of Wronskion W is

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

CO2,L2

Q(30) The particular integral of the differential equation $(D^2 + 3D + 1)y = e^x is$

(a) $\frac{1}{4}e^x$ (b) $\frac{1}{5}e^x$ (c) $\frac{1}{6}e^x$ (d) $\frac{1}{7}e^x$

CO3,L2

--End of Question paper--