## COURSE CODE: MTH174
## COURSE TITLE: COURSE TITLE:ENGINEERING MATHEMATICS

Max. Marks: 30

Time Allowed: 01:30 hrs.

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.

Q1 1.

If a square matrix $A$ satisfies $AA^T = I$, where $I$ is an identity matrix of same order as that of $A$, then the matrix $A$ is.

(a) Idempotent  (b) Orthogonal  (c) Symmetric  (d) Hermitian                    CO1, L1

2. If $\begin{bmatrix} 2x & y+2 \\ x-2 & 6 \end{bmatrix} = \begin{bmatrix} 10 & 3 \\ 3 & 6 \end{bmatrix}$, then what is the value of x :

(a) 2              (b) 3              (c)5              (d) 10

3.

An orthogonal matrix A has Eigen values 1, 2 and 4. What is the trace of the matrix $A^T$?

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

4. If AX=B is non homogenous system of equation then if rank of [A|B] =rank of [A]=number of variables then system of equations has

(a) No solution        (b) unique solution        (c) infinitely many solutions        (d)none

5. Sum of eigen values is equals to

(a)trace of matrix        (b)determinant of matrix        (c)rank of matrix        (d)none

6. Consider the following matrix $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$ The absolute value of the product of the Eigen values of A is

a) 4    b) 5        c) 10        d) none of these

7. The characteristics equation of a matrix A is $t^2 - t - 1 = 0$. then

(a) $A^{-1}$ does not exist    (b) $A^{-1}$ exist but cannot be determined from the data

(c) $A^{-1} = A+I$    (d) $A^{-1} = A-I$

CO1, L1

8) Which of the following matrices is a symmetric matrix?

(a) $\begin{bmatrix} 1 & -5 & 2 \\ -5 & 7 & 5 \\ -2 & 5 & 1 \end{bmatrix}$  (b) $\begin{bmatrix} 0 & 2 & 3 \\ -2 & 0 & -6 \\ -3 & 6 & 0 \end{bmatrix}$  (c) $\begin{bmatrix} 1 & 3 & 5 \\ 0 & 5 & 6 \\ 0 & 0 & 2 \end{bmatrix}$  (d) $\begin{bmatrix} 5 & -2 & 3 \\ -2 & 2 & 4 \\ 3 & 4 & 8 \end{bmatrix}$

CO1, L1

$\begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$, $\begin{bmatrix} 5 \\ 6 \\ c \end{bmatrix}$ and $\begin{bmatrix} 3 \\ 4 \\ 2 \end{bmatrix}$ is linearly dependent when x is equal to

9. The following set of three vectors

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

10. If two eigen values o matrix A of order 3X3, whose determinant is 36 are 2 & 3, then the third eigen value is.

a) 6    b) 5    c) 4    d) 2

11.

If A $y'' + 6y' + 4y = 12x^2$, B $(1-x)y'' + xy' - y = 0$, C $y'' - (1+x^2)y = 0$

Which of these represents differential equation with variable coefficient?

(a) Only B & C   (b) Only A & B   (c) Only A   (d) A, B & C    CO2, L2

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 $(-\infty, -3) \cup (3, \infty)$    CO2, L1

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) $e^{-2x}\cos x, e^{-2x}\sin x$    CO2, L1

14. 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    CO2, L2

15. 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) $y'' - y' - 6y = 0$

16. The general solution of the differential equation $y'' + 4y' + 5y = 0$ is    CO2, L2

(a) $y = e^{2x}(c_1\cos x + c_2\sin x)$   (b) $y = e^{-2x}(c_1\cos x + c_2\sin x)$

(c) $y = e^x(c_1\cos 2x + c_2\sin 2x)$   (d) $y = e^{-x}(c_1\cos x + c_2\sin x)$    CO2, L2

17. Wronskian of 1, sin x of cos x is

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

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) $(c_1 + c_2x + c_3x^2)e^x + c_4$    CO2, L2

19) 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

CO2, L2

(a) $\dfrac{e^x - 2e^{4x}}{3}$    (b) $\dfrac{4e^{4x} - e^x}{3}$    (c) $\dfrac{e^{4x} + 2e^x}{3}$    (d) $\dfrac{7e^x - e^{4x}}{3}$

20) If the particular solution of the homogeneous linear differential equation with constant coefficient is $(1 + x + e^x - 3e^{3x})$. Then the differential equation is

(a) $y^v - 4y''' + 3y'' = 0$    (b) $y''' - 3y'' + 3y'' - y' = 0$

(c) $y''' + 4y''' + 3y'' + y' = 0$    (d) $y^v - 11y''' + 35y'' - 25y' = 0$

CO2, L2

21. Which of the following is true?

(a) $\dfrac{1}{f(D)} \cdot e^{ax} = \dfrac{1}{f(a)} e^{ax}$, $f(a) \neq 0$.

(b) $\dfrac{1}{f(D)} \sin ax = \dfrac{1}{f(a)}$ ... $f(a) \neq 0$

(c) $\dfrac{1}{f(D)} 2 e^{ax} = \dfrac{1}{f(b^2 + a^2)}$ then, $f(a) \neq 0$

(d) None of these.

22) If $y'' + 4y' + 4y = e^{-2x}$ be the non-homogeneous differential equation then by the method of undetermined coefficient, then the trail solution for the particular integral is

(a) $c e^{-2x}$    (b) $c x e^{-2x}$    (c) $(c_1 x + c_2)e^{-2x}$    (d) $c x^2 e^{-2x}$

CO2, L2

23) By method of variation of parameter, if $y_p = A(x)y_1 + B(x)y_2$ is the particular integral of the non-homogeneous differential equation $y'' - 4y' + 3y = e^x$, then $y_1$ and $y_2$ will be

(a) $e^x, e^{3x}$    (b) $e^{2x}, e^{3x}$    (c) $\cos x, \sin 3x$    (d) $e^x, e^{2x}$

CO2, L2

24. Let $x^2 y'' - 2xy' + 2y = x^2 + x$ be a non-homogeneous linear differential equation and $y_1 = x$ and $y_2 = x^2$ be the linear independent solution then the complementary function of the given differential equation is

(a) $x + x^2$    (b) $x - x^2$    (c) $2x + 5x^2$    (d) $ax + bx^2$, where $a$ and $b$ are arbitrary constant. CO2, L2

25) The particular integral $\dfrac{1}{D+4} e^{2x}$ is

(a) $\dfrac{1}{6}e^{2x}$    (b) $\dfrac{1}{2}$    (c) $\dfrac{1}{3}e^{2x}$    (d) $\dfrac{6}{2x+3}e^{2x}$

26) The particular integral $\dfrac{1}{D^2 - 4} e^{4x}$ is

(a) $\dfrac{1}{6}e^{4x}$    (b) $\dfrac{e^{4x}}{2}$    (c) $\dfrac{2}{3}e^{4x}$    (d) doesn't exist

CO2, L2

27.

The particular integral $\dfrac{1}{D^2 - 9D + 20 - 6} \sin 3x$ is

CO2, L2

(a) $-\dfrac{1}{3}\sin 3x$    (b) $\dfrac{1}{50}(\sin 3x + x\cos 3x)$    (c) $\dfrac{1}{9}x\cos 3x$    (d) $\dfrac{1}{50}(\sin 3x + 3\cos 3x)$   CO2, L2

28.

The general solution of the differential equation $y'' - 6y' + 9y = 14$ is

(a) $(c_1 + c_2 x)e^{3x} + \frac{14}{9}$  (b) $(c_1 + c_2 y)e^{3x} + 14$  (c) $(c_1 + 14) + c_2 x\, e^{3x}$  (d) $\left(c_1 + \frac{14}{9} + c_2 x\right)e^{3x}$

CO2, L1

29.

The particular integral $\frac{1}{D+1}(2021)^x$ is

(a) $\frac{1}{D+1}(2021)^x$  (b) $x(2021)^x$  (c) $\frac{1}{\ln 2021}(2021)^x$  (d) $\frac{1}{(\ln 2021)+5}(2016)^x$    CO2, L2

30.

The particular integral of the differential equation $y'' + 2y' + 2y = x^2 e^{-x}$ is

(a) $e^{-x}(x^2 + 2x + 2)$  (b) $e^{-x}(x^2 - 2)$  (c) $e^{-x}(2x^2 + 4x + 2)$  (d) $\frac{e^{-x}x^2}{2}$    CO2, L2

—End of Question Paper—