## Jharkhand University of Technology, Ranchi

Diploma 1st Semester Examination, 2024 (NEP-2024)

**Subject: Engineering Mathematics** 

Subject Code: BSC 101

**Time Allowed: 3 Hours** 

Full Marks: 70

Answer in your own words.

Answer any five questions. Question No. 1 is compulsory.

Marks are given in the right margin.

	1 2 1 3						
1.	Choose	the	correct	answer	in	the	following:

2×7=14

- (i) If A is a  $2 \times 2$  matrix such that |A| = 5 and  $|A| \neq 0$  then the value of |4A| is
  - (a) 20

(b) 25

(c) 80

- (d) None of these
- (ii) If A and B are invertible square matrices of the same order then  $(AB)^{-1} = ?$ 
  - (a)  $AB^{-1}$

(b)  $A^{-1}B^{-1}$ 

(c)  $B^{-1}A$ 

- (d)  $B^{-1}A^{-1}$
- (iii) Find the slope of a line whose inclination is 60°.
  - (a)  $\sqrt{3}$

(b)  $\frac{1}{\sqrt{3}}$ 

(c) 1

- (d) None of these
- (iv) The equation of the line that makes intercepts at  $\dot{2}$  and -3 on the x-axis and y-axis respectively is represented as
  - (a) 2x 3y = 6

(b) x - 2y = 3

(c) 3x - 2y = 6

- (d) None of these
- (v) If  $\sin x = \frac{1}{6}$  then  $\sin 3x$  can be expressed as
  - (a)  $\frac{1}{2}$

(b)  $\frac{13}{27}$ 

(c)  $\frac{12}{27}$ 

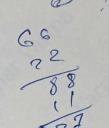
- (d) None of these
- (vi) The first order derivative of  $\log_3 x$  is
  - (a) log 3

(b)  $\frac{1}{x}$ 

(c)  $\frac{1}{x(\log 3)}$ 

(d) None of these

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- (vii) Find the value of the integral  $\int \frac{\sin 2x}{\sin x} dx$ .
  - (a)  $2\sin x + c$
  - (c)  $\frac{1}{2}\sin x + c$

- (b)  $2\cos x + c$  $(d) \frac{1}{2}\cos x + c$
- 2 (a) Prove that  $\begin{vmatrix} 1 & b+c & b^2+c^2 \\ 1 & c+a & c^2+a^2 \\ 1 & a+b & a^2+b^2 \end{vmatrix} = (a-b)(b-c)(c-a).$ 
  - (b) Solve the system of equations x + y + z = 6; 2x + 3y z = 5; 6x 2y 3z = -7 using
- (a) Find the equation of the line passing through the point (-2, -4) and perpendicular to the line 3x - y + 5 = 0.
  - Reduce the equation  $\sqrt{3}x + y + 2 = 0$  to intercept form and find the intercepts on the axes.
  - 4. Find the values of all trigonometric functions of 120°.
    - (b) Prove that:  $\cos \alpha + \cos \beta + \cos \gamma + \cos(\alpha + \beta + \gamma) = 4\cos\left(\frac{\alpha + \beta}{2}\right)\cos\left(\frac{\beta + \gamma}{2}\right)\cos\left(\frac{\gamma + \delta}{2}\right)$ .
  - (a) Find the second order derivative of  $e^{2x} \cos 3x + x^4$ .
    - (b) Obtain the local maxima or local minima of  $f(x) = x^3 6x^2 + 9x + 15$ . Also find the local maximum or local minimum values of f(x).
  - (a) Evaluate:  $\int_{-a}^{a} \sqrt{\frac{a-x}{a+x}} dx$ .
    - (b) Calculate the area bounded by the parabola  $y^2 = 4ax$  and its latus rectum.
- 7+7

- 7. Write short notes on any four:
  - (a) Inverse of a matrix -
  - (b) Collinear points
  - (c) ASTC diagram
  - (d) Stationary points
  - (e) Integration by parts

