03250

AEC01
ALL

Jharkhand University of Technology, Ranchi

Diploma 1st Semester Examination, 2023 (NEP)

Subject : Engineering Mathematics-I **Subject Code : AEC01**

Time Allowed : 3 hours **Full Marks : 70**

Answer any five *questions in which* Question No. 1 *is compulsory and answer* any four *from the rest questions.*

1. Answer the following Multiple Choice Type questions: 7×2=14

(i) How many terms are there between 9, 12, 15, 18, …, 87?

(a) 25 (b) 26

(c) 27 (d) None of these

(ii) The value of $\log_{1/N} N$ is equal to

(a) –1 (b) 1

(c) 0 (d) None of these

(iii) The type of matrix which have a multiplicative inverse—

(a) row matrix (b) column matrix

(c) square matrix (d) None of these

(iv) The system of equation $x = y$ and $x = -y$ has the number of solution—

(a) one solution (b) two solutions

(c) many solutions (d) no solution

(v) Maximum value of $\sin\theta \cdot \cos\theta$ is equal to

(a) 2 (b) 1

(c) $\frac{1}{2}$ (d) None of these

(vi) ${}^{n}C_{r}$ is equal to

(a) ${}^{n}C_{n-r}$ (b) ${}^{n}C_{r-n}$

(c) ${}^{n}C_{n-1}$ (d) None of these

(vii) The slope and x-intercept of the line $3x - y + k = 0$ are equal then the value of k is equal to

(a) 0 (b) –1

(c) 3 (d) –9

2. (a) Resolve $\frac{x^3}{x^2+8x+12}$ into partial function. 7+7

(b) The pth and qth term of a GP are a and b respectively. Find its nth term.

3. (a) Solve these simultaneons equations by Cramer's rule. 7+7

$x + y + 2z = 4$, $2x - y - z = 1$ and $3x - 2y - z = 3$

(b) Show that n is any integer greater than 1 then $6^{2n} - 35n - 1$ is divisible by 1225.

4. (a) In any triangle ABC prove that $\tan\frac{B-C}{2} = \frac{b-c}{b+c}\cot\frac{A}{2}$. 7+7

(b) Prove that $2\tan^{-1}\sqrt{x} = \sec^{-1}\frac{1+x}{1-x}$.

5. (a) Find the equation of straight line passing through the point (3, –2) and making an angle 45° with the line $6x + 5y = 1$. 7+7

(b) If $f(x) = \tan^{-1} x$ prove that $f(x) - f(y) = f\left(\frac{x-y}{1+xy}\right)$.

6. (a) Find the differential co-efficient of $\sin^{-1} x$ from the first principle. 7+7

(b) Find the inverse of the matrix $A = \begin{pmatrix} 1 & -2 & 2 \\ 0 & 1 & -2 \\ 0 & 0 & 1 \end{pmatrix}$.

7. Solve *any two* of the following: 7+7

(a) Evaluate $\lim_{x\to 0}\frac{\tan x - \sin x}{x^3}$

(b) Differentiate $y = \tan^{-1}\frac{2x}{1-x^2}$ with respect to $\sin^{-1}\frac{2x}{1+x^2}$

(c) If $x^m y^n = (x+y)^{m+n}$ then evaluate $\frac{dy}{dx}$