

GYANMANJARI INNOVATIVE UNIVERSITY

GYANMANJARI DIPLOMA ENGINEERING COLLEGE

Diploma Engineering End Semester Examination (ESE)-Summer - 2026

Enrollment No.: _____

Subject Code: DETXX10106

Subject Name: Mathematics

Time: 10:30 AM to 01:30 PM

Date: 01-06-2026

Semester: 02

Total Marks: 100

Instructions:

1. Question No. 1 is compulsory.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Marks
- Q.1 (a) Find the determinant:
- i. $\begin{vmatrix} 15 & 2 \\ 17 & 3 \end{vmatrix}$ 05
- ii. $\begin{vmatrix} 14 & 5 \\ 10 & 2 \end{vmatrix}$
- (b) If $A = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 3 & -1 \\ -3 & 1 & 2 \end{bmatrix}$ then find $|A|$. 05
- (c) If $A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 4 & 2 \\ 2 & 1 & 5 \end{bmatrix}$, $B = \begin{bmatrix} -1 & 1 & 3 \\ 1 & -1 & 1 \\ 2 & 3 & 1 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 1 & 2 \\ 2 & 1 & 1 \\ 4 & 3 & 4 \end{bmatrix}$ then find $A - B + C$. 10
- Q.2 (a) Find the limit (લગ્ગ મેળવો): $\lim_{x \rightarrow 1} (x^3 - 3x^2 + 5x - 6)$ 05
- (b) Prove that (સાબિત કરો કે): $\tan 66^\circ = \frac{\cos 21^\circ + \sin 21^\circ}{\cos 21^\circ - \sin 21^\circ}$ 05
- OR
- (b) Find the value (કિંમત શોધો): 05
- $$3 \sin^2 \frac{\pi}{3} - \frac{3}{4} \tan^2 \frac{\pi}{6} + \frac{4}{3} \cot^2 \frac{\pi}{6} - 2 \operatorname{cosec}^2 \frac{\pi}{3}$$
- (c) If $f(x) = \frac{\sqrt{x+5}}{\sqrt{x+5} + \sqrt{8-x}}$ then prove that $f(x) + f(3-x) = 1$. 10
- [જો $f(x) = \frac{\sqrt{x+5}}{\sqrt{x+5} + \sqrt{8-x}}$ તો સાબિત કરો કે $f(x) + f(3-x) = 1$.]
- OR
- (c) If $f(x) = \log x$ then prove that: 10

[જો $f(x) = \log x$ આપેલ હોય તો સાબિત કરો કે]:

$$f(x) + f(y) = f(x \cdot y) \quad (b) \quad f(x) - f(y) = f\left(\frac{x}{y}\right)$$

Q.3 (a) Find the differentiation with respect to x [xની સાપેક્ષે વિકલન શોધો.] 05

(i) $y = e^x + 4$ (ii) $y = x \log x$

(b) Find the differentiation with respect to x. [xની સાપેક્ષે વિકલન શોધો.] 05

(I) $y = x^2 + 2^x + 2^2$ (II) $y = x^3 - \log x$

(c) Find the differentiation with respect to x [xની સાપેક્ષે વિકલન શોધો.] 10

(i) $y = e^x \sin x$ (ii) $y = \log\left(\frac{\sin x}{1 + \cos x}\right)$

OR

Q.3 (a) Find the differentiation with respect to x [xની સાપેક્ષે વિકલન શોધો.] 05

$$y = \frac{\log x}{x}$$

(b) Find $\frac{dy}{dx}$ of the following parametric functions [પ્રચલ વિધેય માટે $\frac{dy}{dx}$ મેળવો.] 05

$$x = a \cos^2 \theta, \quad y = b \sin^2 \theta$$

(c) Find the differentiation of the following using definition [આપેલ વિધેયનું વ્યાખ્યાની મદદથી વિકલન શોધો:] 10

$$f(x) = x^2 + 2x - 1$$

Q.4 (a) Find the following integral: નીચેના સંકલિત મેળવો. 05

$$\int (5x^3 - \frac{1}{x} + \cos x - e^x) dx$$

(b) Find the following integral: નીચેના સંકલિત મેળવો. 05

$$\int \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)^2 dx$$

(c) Find the following integral: નીચેના સંકલિત મેળવો. 10

$$\int x^2 \sin x dx$$

OR

Q.4 (a) Find the following integral: નીચેના સંકલિત મેળવો. 05

$$\int_1^3 (x^2 + x + 1) dx$$

(b) Find the following integral: નીચેના સંકલિત મેળવો. 05

$$\int \frac{dx}{9+x^2}$$

(c) Find the following integral: નીચેના સંકલિત મેળવો.

1. $\int \left(\frac{2x^2-3x-11}{x} \right) dx$

10

2. $\int (x+1)(x+2) dx$

Q.5 (a) If $A = \begin{bmatrix} 2 & -1 \\ 2 & 0 \end{bmatrix}$ & $B = \begin{bmatrix} 1 & 2 \\ 0 & 2 \end{bmatrix}$, Then find $A+B$.

05

(b) Find the differentiation with respect to x [xની

સાપેક્ષે વિકલન શોધો.] $y = \log(\sin 2x)$

05

(c) If $f(x) = \log\left(\frac{1-x}{1+x}\right)$ then prove that

$$f(x) + f(-x) = 0.$$

10

[જો $f(x) = \log\left(\frac{1-x}{1+x}\right)$ તો સાબિત કરો કે $f(x) + f(-x) = 0$.]

OR

Q.5 (a) If $A = \begin{bmatrix} 2 & 1 & 2 \\ 2 & 2 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ then find $A + 2A$

05

(b) Find the differentiation of the following using definition [આપેલ વિધેયનું વ્યાખ્યાની મદદથી વિકલન શોધો] :

05

$$f(x) = \sin x$$

(c) Find the limit (લક્ષ મેળવો):

1. $\lim_{x \rightarrow 2} \frac{x^2-1}{x-1}$

10

2. $\lim_{x \rightarrow 3} \frac{x^2-9}{x-3}$