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# 2000172(014)

## Diploma in Engg. (First Semester) Examination, Nov.-Dec. 2020

**(New Scheme)**

**APPLIED MATHEMATICS**

***Time Allowed : Three hours***

***Maximum Marks : 70***

***Note :*** *Attempt all questions.*

**Unit-I**

**1.** (a) Prove that : 5

$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$$

(b) Solve into following equation by Cramer's Rule 5

$x + y + z = 6$

$2x - y + z = 3$

$x - 3y + 2z = 1$

**Or**

**2.** Solve into Matrix method : 10

$2x - y + 3z = 9$

$x + y + z = 6$

$x - y + z = 2$

**Unit-II**

**3.** (a) Prove that : 5

$$\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$$

(b) If $\sin x + \sin y = a$ and

$\cos x + \cos y = b$

then prove that

$$\tan\left(\frac{x+y}{2}\right) = \frac{a}{b} \text{ and } \sin(x+y) = \frac{2ab}{a^2+b^2}$$ 5





**Or**

**4.** (a) Solve into

$$\lim_{\theta \to \pi/2} \frac{1-\sin\theta}{(\pi/2-\theta)^2}$$ 5

(b) If $f(x) = 2\sin x + \cos 2x$

$g(x) = \tan x - \sec x$

then show that

$$f\left(\frac{\pi}{6}\right) g(\pi) = \frac{3}{2}$$ 5

**Or**

**5.** Find differential coefficient of $y = \tan x$ by first principle. 10

**Unit-III**

**6.** (a) If $y = \log\left(x + \sqrt{1+x^2}\right)$

then prove that

$$\left(1+x^2\right) y_2 + xy_1 = 0$$ 5

(b) Find the equation of tangent of Normal on the curve

$2y = 3 - x^2$ at the point $(1, 1)$. 5

(c) Find the maxima and minima value of the function

$y = x^3 - 2x^2 + x + 6$. 5

## Unit-IV

7. (a) Find the equation of circle whose passes through the points $(1, 1)$ and $(2, 2)$ and whose radius is 1. 5

(b) Find vertex, directrix, focus, axis of the parabola

$x^2 + 4x + 4y + 16 = 0$. 10

## Unit-V

8. (a) Find Quartile deviation from the following table : 10

| Size | : | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 |
|---|---|---|---|---|---|---|
| Frequency | : | 22 | 38 | 46 | 35 | 19 |

(b) Find Mean, Mode, Median from the given table : 10

| Size | : | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 |
|---|---|---|---|---|---|---|
| Frequency | : | 24 | 40 | 42 | 50 | 55 |