

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
Diploma Engineering, Winter2019 – 20 Examination

Semester: 1
Subject Code: 03604103
Subject Name: Mathematics

Date: 30/12/2019
Time: 02:00pm to 04:30pm
Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. English version is considered to be Authentic.

Q.1 Answer any Eight out of ten. (2 Marks Each)**(16)**

1. Find the order and degree of the given differential equation: $\frac{d^2y}{dx^2} = \sqrt[3]{1 + \left(\frac{dy}{dx}\right)^2}$
2. If $A = \begin{bmatrix} 2 & 1 \\ 3 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 5 \\ 4 & -3 \end{bmatrix}$ and $C = \begin{bmatrix} 4 & 0 \\ -2 & 1 \end{bmatrix}$ find $2A - B + C$.
3. Evaluate: $\lim_{n \rightarrow \infty} \left(\frac{4n^3 - 7n^2 + 5n - 1}{8n^3 + 7n^2 - 4n + 1} \right)$
4. $\int \cos x \sqrt{\sin x} dx$
5. Find mean of weights in kilogram of 10 students given as 32,26,41,35,28,42,36,40,33,42
6. $\frac{d}{dx} \left(\frac{e^x}{2x+3} \right) =$ _____
7. Prove that $\sin^2 \frac{\pi}{4} + \sin^2 \frac{3\pi}{4} + \sin^2 \frac{5\pi}{4} + \sin^2 \frac{7\pi}{4} = 2$
8. Express $\frac{4+i}{2-3i}$ in the form of $x + iy$.
9. Find the probability of getting at most one head when two coins are tossed simultaneously.
10. $\int_0^5 (x^2 + 3) dx =$ _____

Q.2 A) Find the mean of the following data:**(04)**

class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
f_i	5	8	15	16	6

OR

A) If $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$ then find AB and BA . Also check if $AB = BA$.

(04)

B) Find square roots of the complex number $4 + 4\sqrt{3}i$.

(04)**OR**

B) $\frac{\cos \theta}{1 + \sin \theta} + \frac{1 + \sin \theta}{\cos \theta} = 2 \sec \theta$

(04)

C) (a) Find the modulus of $(2i - 3j + k) \times (i - j + 2k)$.

(05)

(b) Evaluate $(i + 2j + k) \cdot (3k - 2j + 4i)$

OR

C) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ then Prove that $A^2 - 5A - 2I = 0$.

(05)

- D) A Fair dice is thrown. Find probability of getting (i) an even number. (ii) perfect square
 (iii) Non zero integer which is greater than 3.

(05)**OR**

D) Find the derivate of the following:

(05)

(i) $y = x^3 \sin x$ (ii) $y = \frac{1 + \tan x}{1 - \tan x}$

Q.3 A) Expand: $(2x + y)^5$ (04)

OR

A) Solve the equations $5x + 3y = 11$ and $3x - 2y = -1$ using the matrix method. (04)

B) Define the following terms (04)

(a) Exhaustive Event (b) Events (c) Trace of a matrix (d) Singular matrix

OR

B) If $A = \begin{bmatrix} 2 & 1 & 5 \\ 0 & 3 & -1 \\ 2 & 5 & 0 \end{bmatrix}$ find A^{-1} . (04)

C) Prove that: (05)

$$(i) \frac{1}{1-\cos\theta} - \frac{1}{1+\cos\theta} = 2\cot\theta \csc\theta \quad (ii) (\tan\theta + \cot\theta)^2 = \sec^2\theta \csc^2\theta$$

OR

C) Find the median and mode from the following data: (05)

Class	10-19	20-29	30-39	40-49	50-59
Frequency	2	9	15	14	10

D) A card drawn from pack of well shuffled cards. Find the probability of the following: (05)

(i) The card drawn is a spade (ii) The card drawn is a king (iii) The card drawn is a face card
(iv) The card drawn is not a club card.

OR

D) If $x = i - 2j + 3k$; $y = -2i + 3j + k$ and $z = 3i + j - 2k$ then (05)

(i) Find $(x + y) \cdot (x - y)$ (ii) Prove that $(x + y) \cdot z = x \cdot z + y \cdot z$

Q.4 A) Show that $y = \frac{a}{x} + b$ (where a and b are arbitrary constants) is a solution of the differential (04)

equation $\frac{d^2y}{dx^2} + \frac{2}{x} \frac{dy}{dx} = 0$.

B) If A and B are two events with $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{4}$, and $P(A \cap B) = \frac{1}{12}$, find (04)

(i) $P(A/B)$ (ii) $P(B/A)$ (iii) $P(A \cap B')$ (iv) $P(B/A')$

C) Find the variance and the standard deviation for the following table: (05)

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	6	14	10	8	1	3	8

D) (i) Find $\left[i^{19} + \left(\frac{1}{i} \right)^{25} \right]^2$ (05)

(ii) Express the following number into $x + iy$ form: $(2 - 3i)(-2 + i)$.