Enrollment No: _____ Exam Seat No: _____

C. U. SHAH UNIVERSITY

Winter Examination-2020

Subject Name: Mathematics-I

Subject Code:4SC01MAT1/4SC01MTC1 Branch: B.Sc. (All)

Semester: 1 Date: 10/03/2021 Time: 11:00 To 02:00 Marks: 70

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 **Attempt the following questions:** **(14)**

a If $A = \begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$ then the characteristic equation of A is _____. 02

(a) $x^2 - 3x + 2$ (b) $x^2 + 3x - 2$ (c) $x^2 + x + 1$ (d) $x^2 - x - 1$

b If $y = \frac{1}{ax+b}$ then y_n = _____. 02

c The rank of identity matrix of order 3 is ____. 01

(a)1 (b)2 (c)3 (d)4

d $\frac{dy}{dx} + P(x)y = Q(x)$, is differential equation of the type_____. 01

(a) Homogeneous (b)Bernoulli's (c)exact (d)linear

e The order of differential equation $\frac{d^2y}{dx^2} = 1 + \left(\frac{dy}{dx}\right)^2$. 01

f The general solution of $y = xp - p^2 + \log p$ is 01

(a) $y = px + 5$ (b) $y = cx - c^2$

(c) $y = x \sin x + c$ (d) $y = xc - c^2 + \log c$

g The Eigen value of Hermitian matrix are_____. 01

(a)Real (b)Complex (c)Purely imaginary (d)None of these

h If $y = x^{10}$ then y_{11} equal to 01

(a) 11! (b) 10! (c) 0 (d) $11x^{10}$

i The value of θ in polar form. 01

(a) $\tan^{-1}\frac{y}{x}$ (b) $\tan\frac{y}{x}$ (c)1 (d) $\sin^{-1}\frac{y}{x}$

j Cartesian co-ordinates of polar co-ordinates $\left(1,\frac{\pi}{2}\right)$ is_____. 01

(a)$\left(1,\sqrt{3}\right)$ (b)(0,1) (c)$\left(1,-\sqrt{3}\right)$ (d)None of these

k To evaluate indeterminate forms we use_____. 01

(a) Leibnitz's rule (b) Rolle's formula

(c) Taylor's formula (d) L'Hospital's rule

l Evaluate:$\lim_{x\to 1}\frac{\log x}{x-1}$ 01

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

a Find n^{th} derivatives of $\cos x \cos 2x \cos 3x$. 05

b If $y=(\sin^{-1}x)^2$, show that 05

$(1-x^2)y_{n+2}-(2n+1)xy_{n+1}-n^2y_n=0$.

c Expand $e^x \sin x$ in power of x by Maclurin's series. 04

Q-3 **Attempt all questions** **(14)**

a Evaluate: $\lim_{x\to 0}\frac{e^x-e^{-x}-2\log(1+x)}{xsin\ x}$ 05

b Verify the Cauchy's mean value theorem for the function 05

$$f(x)=\sin x, g(x)=\cos x, \forall x\in\left[-\frac{\pi}{2},0\right].$$

c Find the distance between two polar co-ordinates. 04

A $(2,10°), B(2,40°)$

Q-4 **Attempt all questions** **(14)**

a. Find eigen value of the matrix $\begin{bmatrix}1&1&3\\1&5&1\\3&1&1\end{bmatrix}$. 05

b. For what value of λ , the following system of equations have no solution. 05

$2x-3y+6z-5t=3;\ y-4z+t=1;\ 4x-5y+8z-9t=\lambda$

c. Find inverse of the matrix $\begin{bmatrix}4&-2&3\\2&4&-1\\0&-2&1\end{bmatrix}$. 04

Q-5 **Attempt all questions** **(14)**

a. Solve given system of equation by using Gauss-Elimination method. 07

$x+2y-z=5,\quad 3x-y+3z=7,\quad 4x-2y+4z=12$

b. Verify Cayley-Hamilton theorem for the matrix 07

$$A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$$

Q-6 **Attempt all questions** **(14)**

a. State and prove Leibnitz's theorem. 07

b. Solve: $p^2 - 7p + 10 = 0$ 05

c. Check whether the equation $(x^2 - ay)dx + (y^2 - ax)dy = 0$ is exact or not? 02

Q-7 **Attempt all questions** **(14)**

a. Solve: $e^x \tan y\, dx + (1 - e^x) \sec^2 y\, dy = 0$ 05

b. Solve: $x^2 \frac{dy}{dx} = 3x^2 - 2xy + 1$ 05

c. Find the equation of sphere through the circle $x^2 + y^2 + z^2 = 9, 2x + 3y + 4z = 5$ and the point $(1,2,3)$. 04

Q-8 **Attempt all questions** **(14)**

a Obtain spherical and cylindrical co-ordinates of the point whose cartesian co-ordinates are $\left(-\sqrt{3}, -1, 2\sqrt{3}\right)$. 07

b. Evaluate: $x \xrightarrow{\lim} \left(\frac{\pi}{2}\right) (\sin x)^{\tan x}$ 04

c. Find equation of sphere of diameter points are $(1, -1, -3)$ and $(-5, -3, 0)$. 03