P P SAVANI UNIVERSITY

Second Semester of Diploma Examination

May 2022

IDSH1040 Engineering Mathematics

31.05.2022, Tuesday **Time: 10:00 a.m. To 12:30 p.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in same answer sheet.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1 **Choose the correct answer:** **[10]**

(i) Find the $\lim_{x\to 0}\frac{\sin x}{x}$?

a) 1 **b)** 0 **c)** -1 **d)** None of these

(ii) The function " $\sin x$ " is an _____

a) Odd function **b)** Even function **c)** Both **d)** None of these

(iii) The value of $\frac{d}{dx}(x+x^2)$ _____

a) 1 **b)** $1+2x$ **c)** $2x$ **d)** 0

(iv) The value of $\frac{d}{dx}(\log x)$ is given by _____

a) $\frac{1}{x}$ **b)** x **c)** 0 **d)** 1

(v) $\frac{d}{dx}e^x = e^x$

a) True **b)** False

(vi) What is the value of $\frac{d}{dx}\operatorname{cosec} x$?

a) $-\cot x$ **b)** $-\operatorname{cosec} x \cot x$ **c)** $-\sec x$ **d)** $-\sin x$

(vii) Find the value of $\int \frac{1}{x^2-a^2}dx$

a) $\frac{1}{2a}\log\left|\frac{x-a}{x+a}\right| + c$ **b)** $\frac{1}{a}\log\left|\frac{x-a}{x+a}\right| + c$

c) $\frac{1}{2a}\log\left|\frac{x+a}{x-a}\right| + c$ **d)** $\frac{1}{a}\log\left|\frac{x-a}{x+a}\right| + c$

(viii) What is the value of $\int k dx$?

a) $k\frac{x}{2}+c$ **b)** $\frac{x}{2}+c$ **c)** 0 **d)** $kx+c$

(ix) What is the value of $\int \frac{3}{x}dx$?

a) $3\log x + c$ **b)** $\log x + c$ **c)** $\frac{\log x}{3}+c$ **d)** 1

(x) $\int \cos hx\, dx = sinhx + c$

a) True **b)** False

Q - 2 **Answer the following: (Any Four)** **[20]**

(i) Evaluate: $\lim_{x\to\frac{\pi}{4}}\left(\frac{\sec x+\tan x}{\sin x+\cos x}\right)$

(ii) Evaluate: $\lim_{x\to 1}\frac{x^3-64}{x^2-16}$

(iii) Find $\frac{dy}{dx}$ if $y = \frac{(x+2)(x+1)}{(x-2)(x-1)}$

(iv) Find $\frac{dy}{dx}$ for the function $ax^2 + by^2 + 2hxy = 0$

(v) Find the volume of the solid formed when the area bounded by the curve $y^2 = 4x$ between $x = 1$ and $x = 2$ rotated about x-axis.

(vi) Evaluate: $\int_1^2\{\frac{1}{x}+\sqrt{x}+(x+1)^2\}dx$

SECTION – II

Q - 1 **Choose the correct answer:** **[10]**

(i) The power of the highest derivative term in the differential Equation is _____

a) Order of differential equation **b)** Degree of Differential Equation

c) Differential equation **d)** Equation

(ii) Find the integrating factor of $\frac{dy}{dx} + \frac{1}{x}y = x$.

a) $\log x$ **b)** $\frac{1}{x}$ **c)** x **d)** 0

(iii) $\frac{dx}{dy} + P(y)x = Q(y)$ is a Linear differential equation.

a) True **b)** False

(iv) Find the order of $\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} + \frac{dy}{dx} + y = 0$

a) 1 **b)** 2 **c)** 3 **d)** 0

(v) If $z = cos\theta + i\sin\theta$ the find $\frac{1}{z^n}$?

a) $\cos\theta - i\sin\theta$ **b)** $\cos n\theta - i\sin n\theta$ **c)** $\cos\theta + i\sin\theta$ **d)** $\cos n\theta + i\sin n\theta$

(vi) If $z_1 = \cos 3\theta + i\sin 3\theta$ and $z_2 = \cos 6\theta + i\sin 6\theta$ then find $z_1 z_2$?

a) $\cos 3\theta - i\sin 3\theta$ **b)** $-\cos 3\theta + i\sin 3\theta$

c) $\cos 6\theta - i\sin 6\theta$ **d)** $\cos 6\theta + i\sin 6\theta$

(vii) Complex number $z = a + ib$ if b= 0 then the complex number is .....

a) Imaginary Number **b)** Purely real number

c) Conjugate Number **d)** None of these

(viii) The conjugate of the complex number $\frac{3i+4}{2-3i}$ is

a) $\frac{-1}{13} - \frac{18}{13}i$ **b)** $\frac{-1}{13} + \frac{18}{13}i$

c) $\frac{1}{13} + \frac{18}{13}i$ **d)** $\frac{1}{13} - \frac{18}{13}i$

(ix) In mode formula, mode $z = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right)h$. What does f_2 represents?

a) The frequency of the class preceding the modal class.

b) The frequency of the modal class.

c) The frequency of the class succeeding the modal class.

d) None of these.

(x) What is median?

a) The average Number **b)** The middle number

c) The most frequent number **d)** None of these

Q - 2 **Answer the following: (Any Four)** **[20]**

(i) Find integrating factor of $2\cos x\left(\frac{dy}{dx}\right) + 4y\sin x = \sin 2x$

(ii) Solve: $\frac{dy}{dx} = xy + y + x + 1$

(iii) Find the modulus and argument of $\frac{1+3\sqrt{3}i}{\sqrt{3}+2i}$

(iv) Express $\frac{3+i}{2-5i} + \frac{3-4i}{5+2i}$ in $a + ib$ form, Also find the conjugate of it.

(v) Find the mean of following frequency distribution by using assumed mean method:

Class	300-350	350-400	400-450	450-500	500-550	550-600	600-650	650-700
Frequency	24	40	33	28	30	22	16	7

(vi) The Median of following frequency distribution is 52.2. Find the missing frequencies f_1 *and* f_2.

Class	Frequency
0-10	2
10-20	f_1
20-30	9
30-40	12
40-50	17
50-60	f_2
60-70	15
70-80	9
80-90	7
90-100	4
Total	100

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