## Q.6 Attempt any two:

i Two Judges in a beauty contest rank the ten competitors in the following 5 order:

First judge	6	1	2	1	2	7	9	8	10	5
opinion	O	4	3	1	2	,	9	o	10	5
Second judge	1	1	6	7	5	8	10	9	3	2
opinion	4	1	O	,	5	o	10	7	3	_

Find the correlation between their judgements.

ii Fit a second-degree parabola to the following data regarding *x* as an 5 independent variable:

iii 200 digits were chosen at random from a set of tables. The frequencies 5 of the digits were:

Use the  $\chi^2$  test to assess the correctness of the hypothesis that the digits were distributed in equal numbers in the tables from which these were chosen. The 5% value of  $\chi^2$  for 9 d.f. is 16.919.

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Total No. of Questions: 6

Total No. of Printed Pages:4





## Faculty of Engineering

End Sem (Even) Examination May-2022 EN3BS03 Engineering Mathematics -III

Programme: B.Tech. Branch/Specialisation: AU/ME/CE/FT/RA

Duration: 3 Hrs. Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i.  $f(z) = |z|^2$  is 1 (a) Differentiable and analytic everywhere (b) Not differentiable and not analytic at z = 0(c) Differentiable at z = 0 but not analytic at z = 0(d) None of these ii. A point at which a function ceases to be analytic is called a 1 (a) Singular point (b) Non-singular point (d) None of these (c) Regular point iii. Order of convergence of Regula-Falsi method is (a) 1.321 (b) 1.618 (c) 2.231 (d) None of these iv. Jacobi's method is also known as 1

- (a) Simultaneous method
- (b) Displacement method
- (c) Simultaneous displacement method
- (d) None of these
- v. Let h be the finite difference, then forward difference of f(x) is
  - (a)  $\Delta f(x) = f(x+h) f(x)$
- (b)  $\Delta f(x) = f(x-h) f(x)$

(c)  $\Delta f(x) = f(x+h)$ 

- (d) None of these
- vi. The Bessel's interpolation formula gives best interpolate values of y 1 for u when

(a) 
$$\frac{1}{4} < u < \frac{3}{4}$$

(b) 
$$-\frac{1}{4} < u < \frac{1}{4}$$

(c) 
$$-1 < u < 0$$

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- vii. In trapezoidal rule, the curve y = f(x) is assumed to be
  - (a) Straight line
- (b) Circle

(c) Parabola

- (d) None of these
- viii. Picard's method is applicable to find the solution of

1

1

- (a) Transcendental equation only
- (b) System of linear equations
- (c) Ordinary differential equation of first order
- (d) None of these
- ix. If the value of any regression coefficient is zero, then two variables 1 are
  - (a) Dependent
- (b) Independent

(c) Correlated

- (d) None of these
- x. If the correlation coefficient have positive value, then the slope of the regression line
  - (a) Must also be positive
- (b) Can be either negative or positive
- (c) Can be zero
- (d) None of these

## Q.2 Attempt any two:

- i. Find the imaginary part of the analytic function whose real part is  $x^3 3xy^2 + 3x^2 3y^2$
- ii. Using Cauchy's integral formula, prove that  $\int_C \frac{e^{2z}}{(z+1)^4} dz = \frac{8\pi e^{-2}}{3}i, \quad 5$

where C is the circle |z| = 3.

- iii. Find the poles, order of poles and residues at it for the function 5  $f(z) = \frac{1}{z^4 + 1}.$
- Q.3 Attempt any two:
  - i. Find the cube root of 2 approximately by Newton Raphson method 5 correct to five decimal places.
  - ii. Solve the following simultaneous equations by Gauss seidel iteration method

$$10x + y + z = 12$$
;  $2x + 10y + z = 13$ ;  $2x + 2y + 10z = 14$ 

- iii. Solve the following simultaneous equations by Gauss elimination 5 method 10x + y + 2z = 13; 3x + 10y + z = 14; 2x + 3y + 10z = 15
- Q.4 Attempt any two:
  - i. Using Newton's Gregory Backward Difference formula, find the 5 cubic polynomial which takes the following values

x: 0 1 2 3

y: 1 2 1 10

ii. Using Newton's Divided Difference Formula find the value of f(6) 5 from the following data

x: 1 2 7 8

y: 4 5 5 4

iii. Using Stirling formula, find  $y_{28}$ ; given

*x*: 20 25 30 35 40

y: 49225 48316 47326 45926 44306

- Q.5 Attempt any two:
  - i. A river is 80 metres wide. The depth d (in metres) of the river at a 5 distance x from the bank is given by the following table

: 0 10 20 30 40 50 6

y: 0 4 7 9 12 15 14 8 3
Find approximately the area of cross section of the river using

Simpson's three-eight rule.

ii. Employ Taylor's series methods to obtain approximate value of y at 5

x = 0.2 for the differential equation  $\frac{dy}{dx} = 2y + 3e^x$ , y(0) = 0. Compare

the numerical solution with exact solution

iii. Using Runge-Kutta method, solve

 $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}, y(0) = 1 \text{ at } x = 0.2 \text{ and } 0.4 (h = 0.2)$ 

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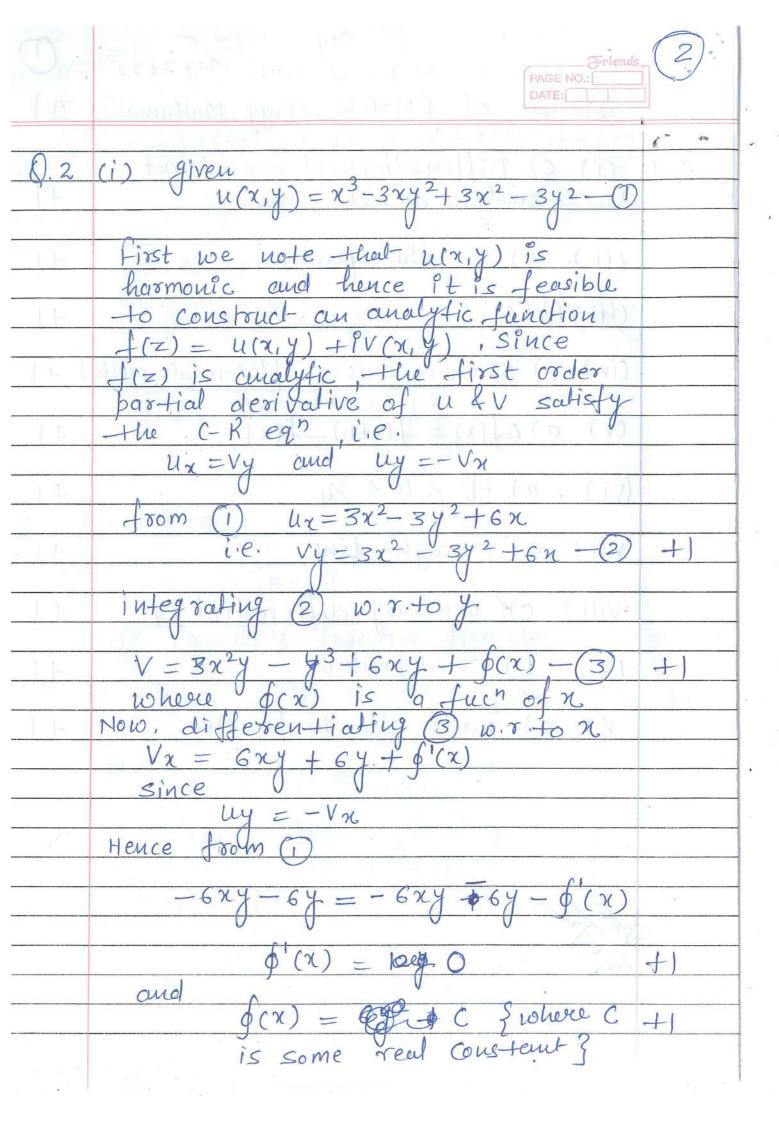
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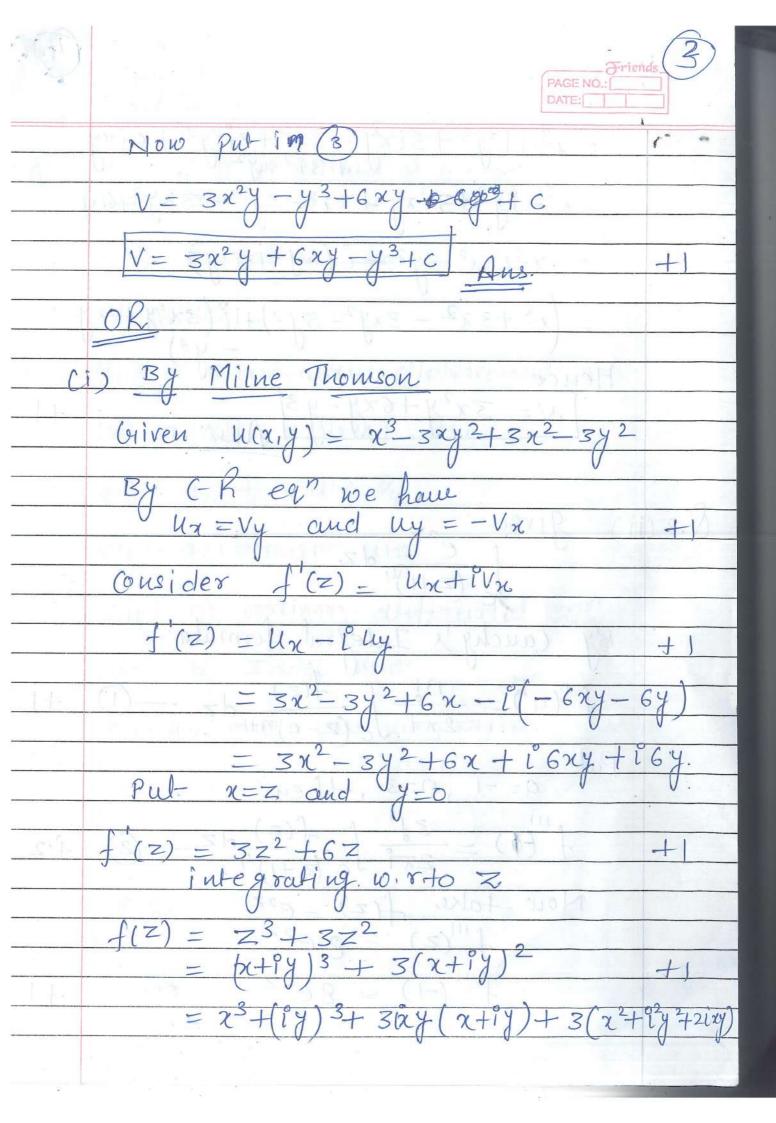
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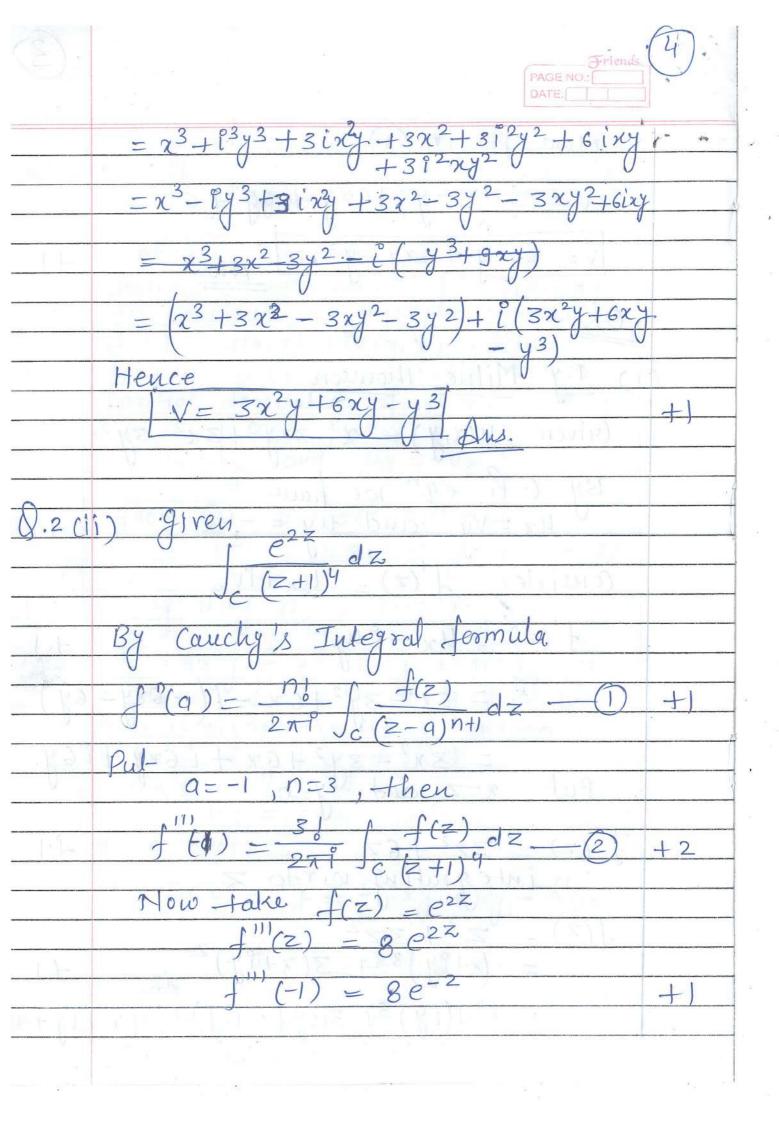
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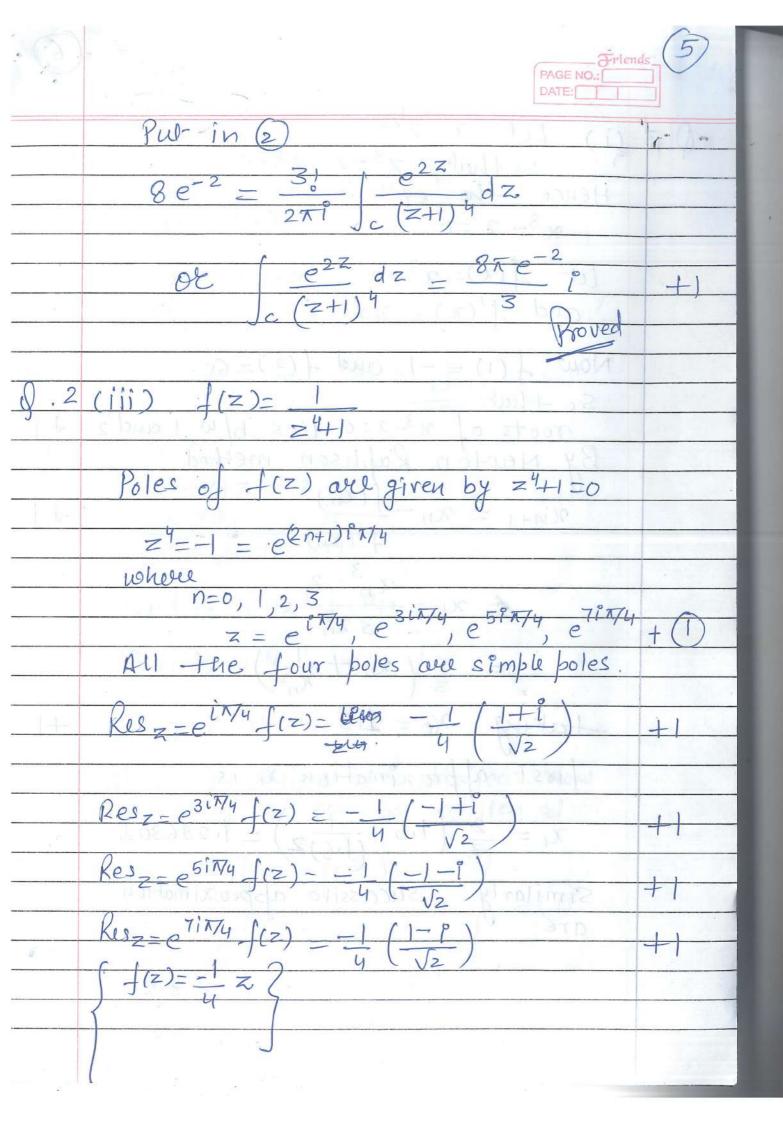
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	Solution of EN3BS03 (Engg. Mathematics-	
Ø. L	(i) c) Differentiable at z=0 but not analytic at z=0	+1
	(ii) a) singular point	+1
	Ciii) b) 1.618	+)
	(iv) c) simul-famous clisplacement-method	+1
	(v) a) $\Delta f(x) = f(x+h) - f(x)$	+)
	(vi) . a) + < U < 3/4	+1
	vii) 9) straight line	+)
	Viii) c) ordinary differential eqn	41
1 1-	ix) b) Indépendent	+1
	X) a) must-also be positive	+1
	Pull I Will Day Stub	
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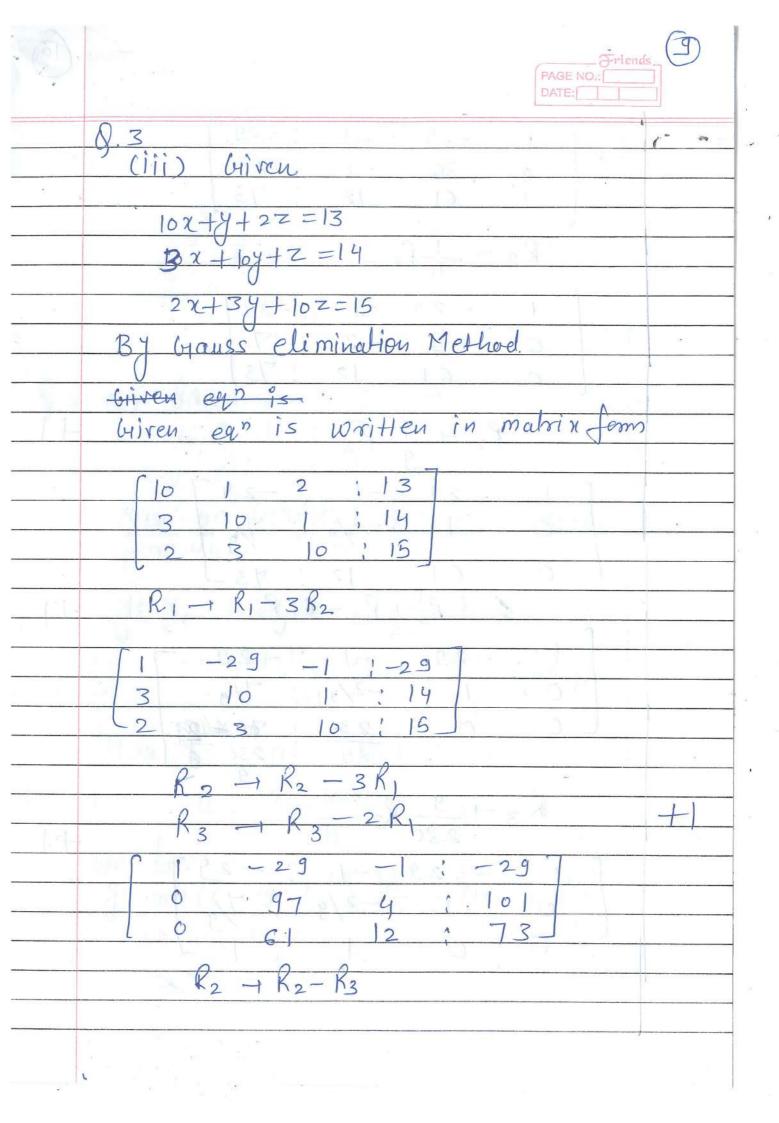
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0.3	(i) Let 2= 2/3	( · ·
9	So that $\chi^3 = 2$	
	Hence the egn	
	$\chi^3 - 2 = 0$	
	1.3	
	$let - \int (x) = x^3 - 2$	
-	and $f'(x) = 3x^2$	
	Nous Con I and Con C	
	Now $f(1) = -1$ and $f(2) = 6$	
	So that	1.1
	roots of x3-2=0 lies b/w 1 and 2	+
	By Newton Raphson method.	
	$\chi_{n+1} = \chi_n - \frac{f(\chi_n)}{1}$	+1
	f (xn)	4)
	$\frac{3-2}{2}$	
0	$= \chi_{1} - \frac{\zeta_{0}}{3\chi_{0}^{2}}$	
1) F	3 2h	
	29/00/ 11/10=20/20/20/1-11/11/11	
	3 ( 1,2)	
	-taking 16 = 2.5	+1
	first approximation 4 is	
	$\chi = \frac{2}{1.5 + \frac{1}{1.5}} = 1.29630$	
	$\chi_1 = \frac{2}{3} \left( \frac{1.5}{1.6} + \frac{2}{1.6} \right) = 1.29630$	
	Similarly, successive approximation	
	gre growing the	

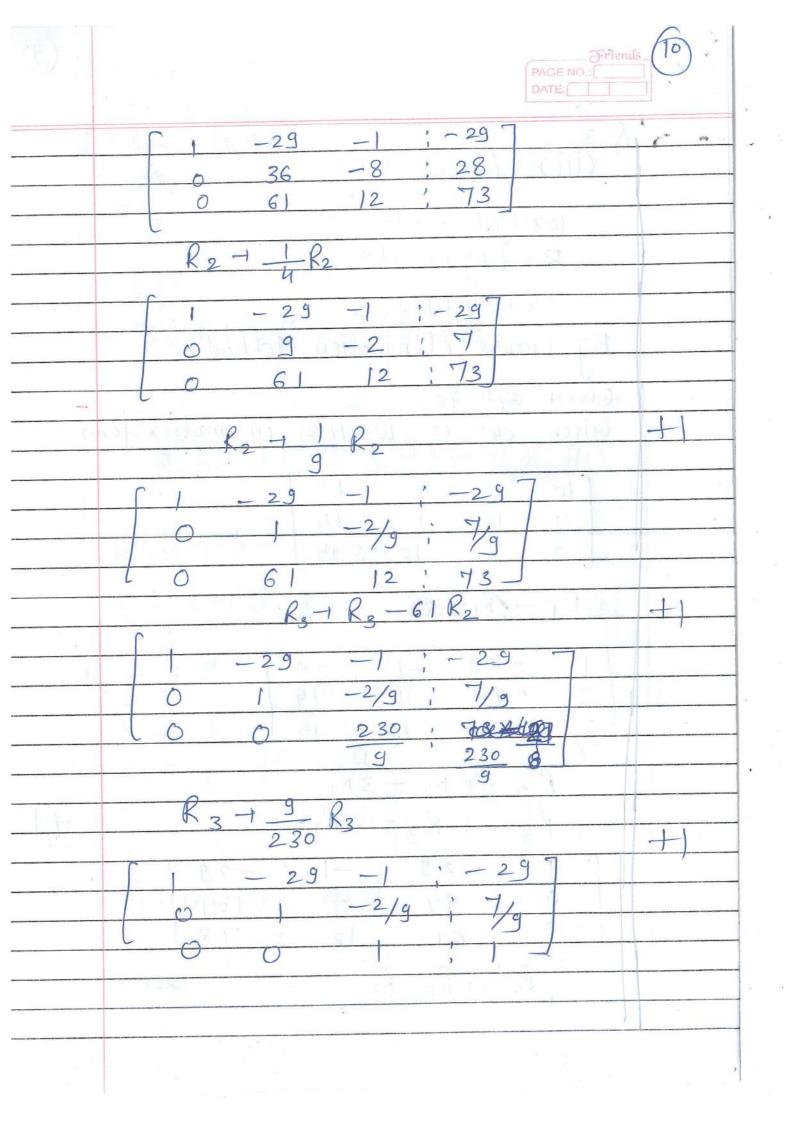
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	X2= 1.26093	
	the and the second and the second second	-
	$\chi_3 = 1.25992$	
	with the first of the second	
	$\chi_{y} = 1.25992$ Since $\chi_{3} = \chi_{y}$	1+1
-	Since x2 = xy	
	h tangar - 1 a - 2 - 2 - 2 - 1 till 120	
	$2^{1/3} = 1.25992 \Lambda$	1+1
	Quis-	
. 1	Month of the first and are finding	
Q.3	(ii) Given	
9	10x + y + z = 12;	
	2x + 10y + Z = 13	
	2x+2y+10Z=14	
*	the state of the s	
	(ay 1 > 1 ay 2 1 + ay 3)	
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34	[9 <sub>22</sub> ] 7,  9 <sub>21</sub> ] +  9 <sub>23</sub> ]	
		1
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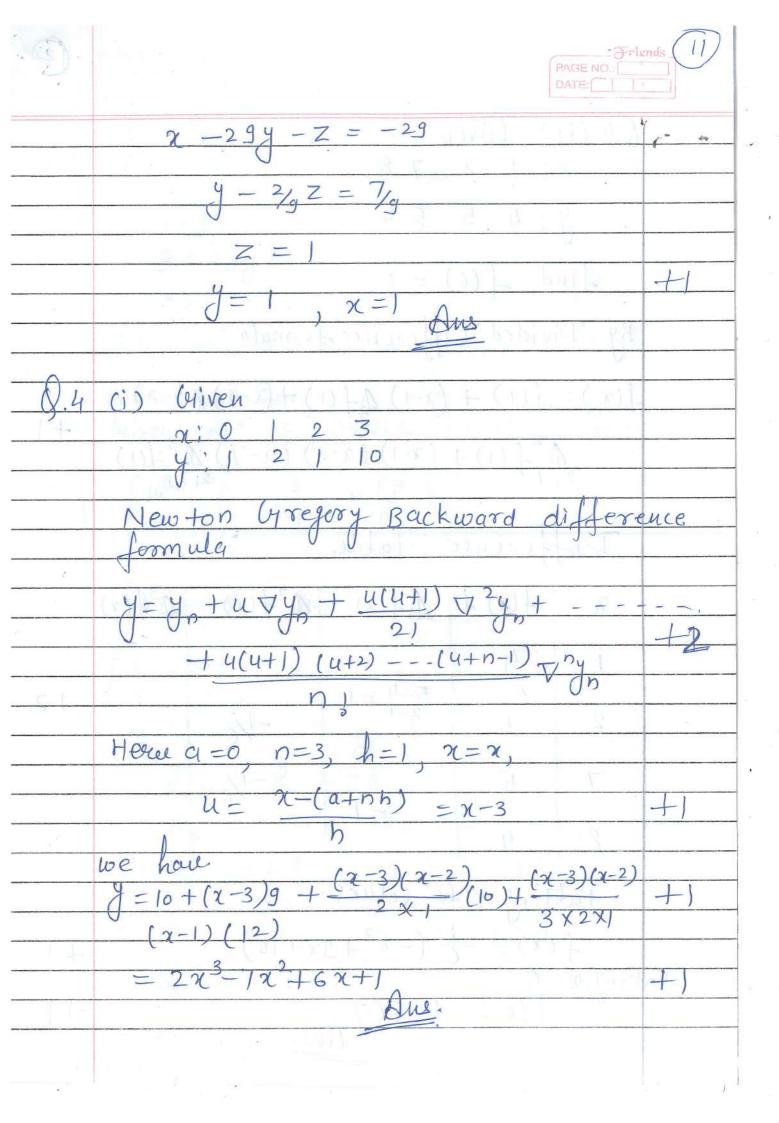
above condition is satisfied. Now system of eq? can be written as

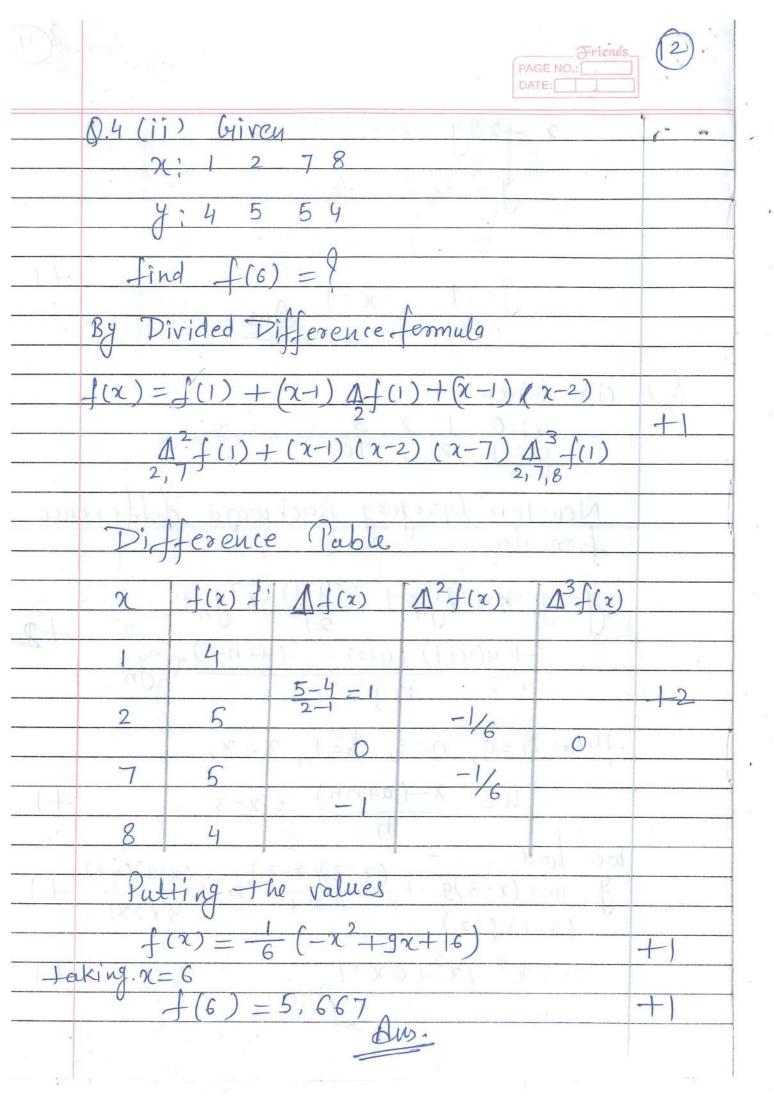


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	Starting with initial approximation	y = 49
	2=0 4=0. Z=0	
	Lor first approximation	
		1
	Putting y=0, z=0 in 1) we have	
	a President	
4	$\chi^{(1)} = 1.2$	
	Putting 2=1.2, z=0 in (1) forfinding y	
11-		
	y = 1.06	
	Putting x=1.2, y=1.06 in (1) for finding	
	Z ( ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )	
	Z(1)=0,948	+1
	2 7 - 0,9 90	+
	for second iteration	
, , , , , , , , , , , , , , , , , , ,	$\chi^{(2)} = 0.999$ $5 + exting .06$ , $z = 0.948$	-
	$\frac{1}{2}$ $\frac{1}$	
	74(2) = 1.005 { Since x=0.999, Z=0.948	
14-1		
	z(2) = 0.99901 + 1801	+1
	For third iteration	
2.54	x(3)=1,000 ad MD 1/20 (2) MA 1/2/2	
- 27	4(3) = 1.000	
	V ( \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
1-1-	$Z^{(3)} = 1.000$	
	for fourth	+1
	$\chi(4) = 1.000  \chi(4) = 1.000  \chi(4) = 1.000$	
	Hence x=4=Z=1 1.	
	Hence x=y=Z=1	

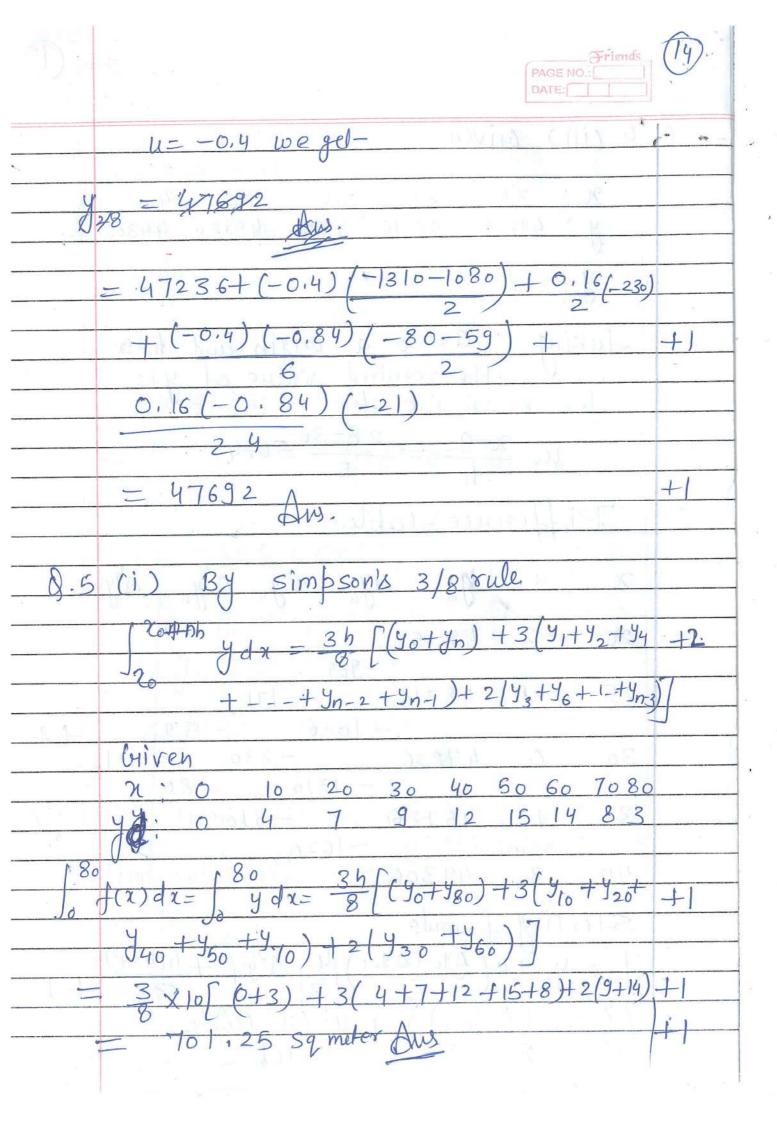






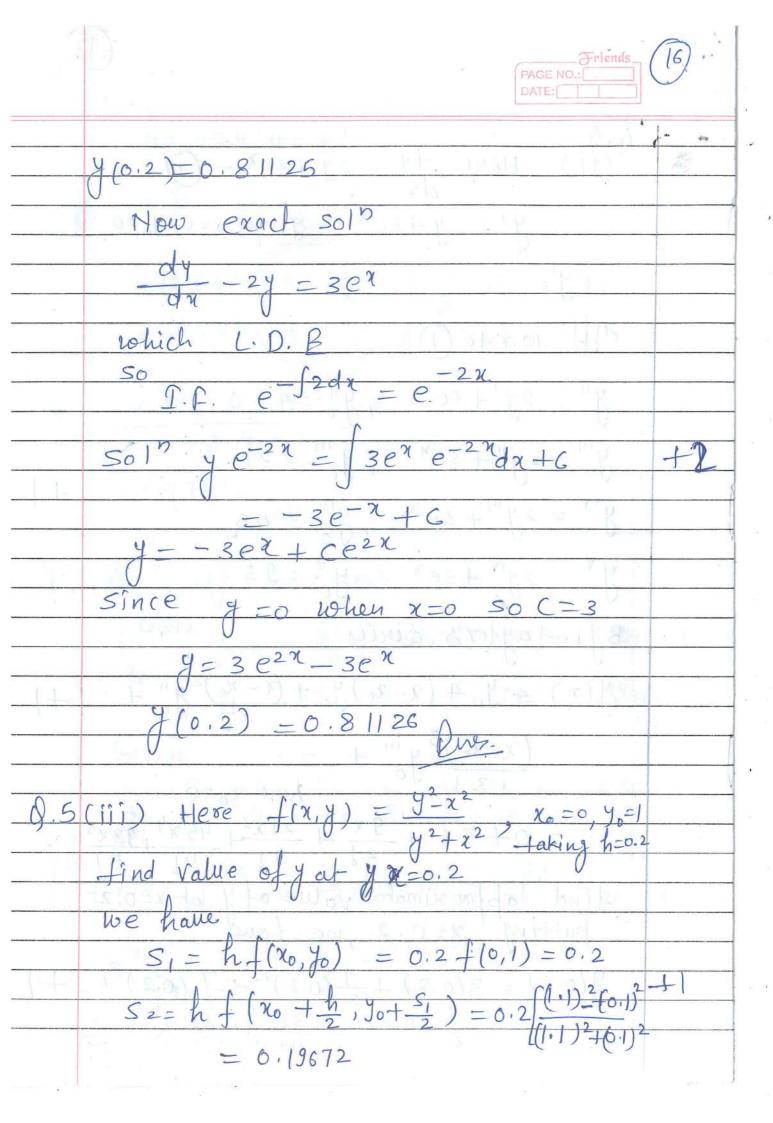


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11.	Hak	ing.	Q = 30	as or	rigin	and h	=5	
1	7	0	a=30	rived v	ralue	of y	ì <u>s</u>	
	for	$\chi = \chi$	28 j.e.	fer		V	0	
		U= 2	<u>-a</u> = .	20-3	=0.1	2	- Marie - 10	
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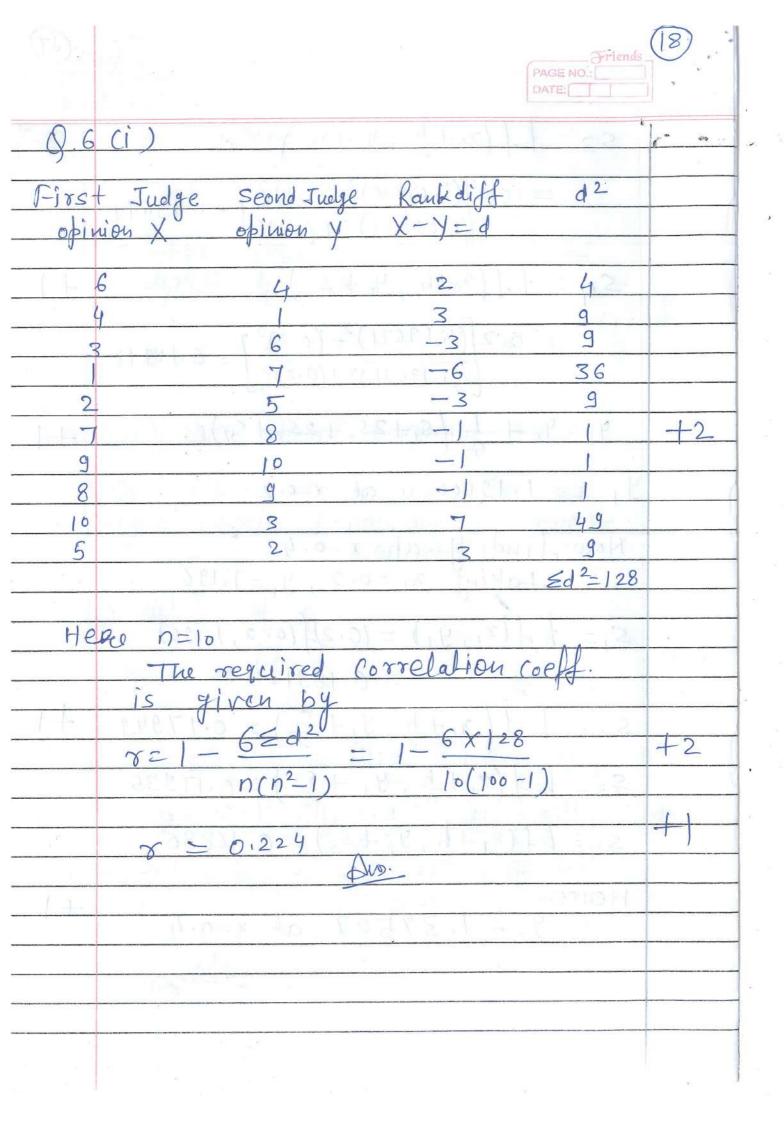


	0.5	· -
	(ii) Here dy = 2y +3ex - ()	
	<u> </u>	
	$y' = 2y + 3e^{\pi}$ given $x = 0, y_0 = 0$	
	V	
	y' = 3	
-	diffe in	
	diff" w.r.+o ()	
	U') 24 1 20% 111 -0	
	$y'' = 2y' + 3e^{2}$ , $y'' = 9$	
( L	$y''' = 2y'' + 3e^{x}$ , $y''' = 2$	
<del></del>	0 - 2 7 30	1 1
	$y'' = 2y''' + 3e^{x}$ , $y'' = 45$	+
	0 0 - 93	
*	y = 2y' + 3e7 y = 93	
	SEED BE FORK HAVE THE REPORT OF MINISTER	
	By raylor's Deries	it.
	$y(x) = y_0 + (2 - x_0)y_0 + (x - x_0)^2 y'' +$	1
	2	. ,
	$(\chi-\chi_0)^3$ y 111 +	
	31 hove x =0	
- 1	- 012x 19x2, 21x3, 45x4 02x5	2 1
	$= 0 + 3 \times + \frac{9 \times^{2}}{2 \cdot 1} + \frac{21 \times^{3}}{3 \cdot 1} + \frac{45 \times^{4}}{41} + \frac{93 \times^{5}}{51}$	
	find approximate value of y at x=0,2	
	find approximate value of y at $x=0.2$ putting $x=0.2$ , we have	
	party 120.2 we have	***************************************
1 1 - 3	$g(0,2) = 3(0,2) + \frac{9}{2}(0.2)^2 + \frac{1}{2}(0.2)^3 + 1$	+1
	15 (0 2)4 1 31 (0.2)51	· · · · · ·
	$\frac{15}{8}(0.2)^{4} + \frac{31}{40}(0.2)^{5} +$	



		7)
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e	DATE:	
A	$S_3 = hf(x_0 + \frac{h}{2}, y_0 + \frac{S_2}{2})$	1000
	$= 0.2 \left[ (1.09836)^{2} + (0.1)^{2} \right] = 0.1967$ $= 0.2 \left[ (1.09836)^{2} + (0.1)^{2} \right] = 0.1967$	eri-l da
	Sz, = hf(20+h, y0+53)	+1
5	$= 6.2 \left[ (1.19671)^2 - (0.2)^2 \right] = 6.18913$ $= 6.18913$	
<u>C</u> +	$9, = 90 + \frac{1}{6} (S_1 + 2S_2 + 2S_3 + S_4)$	+1
	Y, = 1.19600 at x=0.2	B
	Now find y at x=0.4	2
*	taking 2, =0,2, y, =1,196	
	$S_1 = \frac{1}{2} f(x_1, y_1) = (0.2) f(0.2, 1.196)$	al-f
	= 6.18912	1
S +	$S_2 = h f(x_1 + \frac{h}{2}, y_1 + \frac{s_1}{2}) = 0.17949$	+1
	$S_3 = h f(x, + \frac{h}{2}, y, + \frac{S_2}{2}) = 0.17935$	
	Sy=hf(20+h, 9, +53) = 0.16880	
	Hence $y_2 = 1.37527$ at $x = 0.4$	+)
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parabola to be fitted	10 -1	he	
$f=a+bx+cx^2$			
then its normal egne	s all	(iii)	0.10
$\leq y = mq + b \leq x + c \leq x^2$	Lond L		
2 2 MAT BERT CER	1555 -	lieikal	
$= 2xy = qex + bex^2 + ce$	$\leq \chi^3$	United	
C ~2 1 2	- Li		+1
	$\leq \chi^{7}$	JA 181	
$\chi$ $\gamma$ $\chi^2$ $\chi^3$ $\chi^4$ $\chi\gamma$	2 2 y	2 10	
0 1 0 0 0 0	0		
1 5 1 1 5	5		
2 10 4 8 16 20 3 22 9 27 81 66		0	+2
3     22     9     27     81     66       4     38     16     64     256     15		<b>6</b> 8	
$5x = 10$ $5y = 76$ $5x^{2} = 30$ $5x^{3} = 100$ $5x^{4} = 354$ $5$		22y =	
- (20 - 30 1 ° (25-30) - 3 (35-30)	243	851	
substituting these values	in no	rmal eg?	
76=5a+10b+30G		75	1 1
243=109 + 30b + 100G	708	. jib	
851 = 309 + 100b + 354C			

