SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR (AUTONOMOUS)

Siddharth Nagar, Narayanavanam Road – 517583 <u>OUESTION BANK (DESCRIPTIVE)</u>

Subject with Code: Numerical & Statistical Methods (23HS0832)

Course & Branch: B.Tech -CE

Year &Sem: II-B.Tech& I-Sem

Regulation: R23

<u>UNIT –I</u>

SOLUTION OF ALGEBRAIC & TRANSCENDENTAL EQUATIONS

1	a) Find the root of the equation $x^2 - 5 = 0$ by using Bisection method.	[L1][CO1]	[2M]
	b) Write the formula to find the root of an equation by Regula Falsi method.	[L1][CO1]	[2M]
	c) Write the formula to find the root of an equation by Newton Raphson's method.	[L1][CO1]	[2M]
	d) Compare Jacoby and Gauss Seidel methods.	[L5][CO1]	[2M]
	e) Solve by Jacoby method [Only two iterations] x + y = 3; $3x - 2y = 4$.	[L3][CO1]	[2M]
2	a) Find a positive root of the equation $x^3 - x - 1 = 0$ by Bisection method.	[L1][CO1]	[5M]
	b) Find out the square root of 25 given $x_0 = 2.0$, $x_1 = 7.0$ using Bisection method.	[L1][CO1]	[5M]
3	a) Find a positive root of the equation $x^4 - x - 10 = 0$ by iteration method.	[L1][CO1]	[5M]
	b) Solve $x^3 - 2x - 5 = 0$ for a positive root by iteration method.	[L3][CO1]	[5M]
4	Find the root of the equation $x e^{x} = 2$ using Regula-falsi method.	[L1][CO1]	[10M]
5	Find the root of the equation $x^3 - x - 4 = 0$ using False position method.	[L1][CO1]	[10M]
6	Find a real root of the equation $xtanx+1=0$ using Newton – Raphson method.	[L1][CO1]	[10M]
7	Find a real root of the equation $e^x sin x = 1$ using Newton – Raphson method.	[L1][CO1]	[10M]
8	Solve the following system of equations by Jacobi method 27x + 6y - z = 85; $x + y + 54z = 110$; $6x + 15y + 2z = 72$.	[L3][CO1]	[10M]
9	Solve the following system of equations by Jacobi method 2x - 3y + 20z = 25; $20x + y - 2z = 17$; $3x + 20y - z = -18$.	[L3][CO1]	[10M]
10	Apply Gauss Siedel iteration method to solve equations 20x + y - 2z = 17; $3x + 20y - z = -18$; $2x - 3y + 20z = 25$.	[L3][CO1]	[10M]
11	Solve the following system of equations by Gauss-Siedel method 4x + 2y + z = 14; $x + 5y - z = 10$; $x + y + 8z = 20$.	[L3][CO1]	[10M]



<u>UNIT –II</u>

INTERPOLATION

1	a) Write Newton's forward interpolation formulae.												[L1][CO2]	[2M]	
	b) Construct a forward difference table for the function $y = x^2$ for $x = 0, 1, 2, 3$.										[L1][CO2]	[2M]			
	c) Write Lagrange's interpolation formulae.										[L1][CO2]	[2M]			
	d) State the two normal equation used in fitting a straight line.										[L1][CO2]	[2M]			
	e) Write the normal equations used in fitting a second degree polynomial.										[L1][CO2]	[2M]			
2	a) Using Newton's forward interpolation formula and the given table of values											[L3][CO2]	[5M]		
	x 1 1.4 1.8 2.2														
	f(x) 3.49 4.82 5.96 6.5														
	Obtain the value of $f(x)$ when $x=1.6$.														
	b) Applyin given t	ıg New hat √5	ton's = 2.2	forwa 236 ;	rd inte $\sqrt{6} =$	rpol 2.44	ation for $.9; \sqrt{7}:$	rmula = 2.6	a, comp 646 ; √	$\frac{1}{8} =$	the va 2.828	ılu 8.	e of $\sqrt{5.5}$	[L3][CO2]	[5M]
3	From the f	ollowi	ng tab	ole val	ues of	x an	d v=tan	x. Ir	terpola	te th	ne valu	ies	s of v when	[L5][CO2]	[10M]
	x = 0.12 and	d x = 0.1	28.				2		1				5		
	<i>x</i> 0	.10	0.1	15	0.20)	0.25		0.30						
	v 0.1	003	0.14	511	0.202	27	0.2553	3	0.3093						
	y 0.1005 0.1511 0.2027 0.2555 0.5075														
4	a) Using Newton's forward interpolation formula and the given table of values											fvalues	[L3][CO2]	[5M]	
		x	1	.1	1.3		1.5		1.7		1.9]		
		f(x)	0.	21	0.69)	1.25		1.89		2.61		-		
	Obtain	the val	ue of	f(x) w	hen <i>x</i> =	1.4.				1			J		
	b) Use Nev	vton's	backv	ward i	nterpo	latio	n formu	la to	find f(3	32) g	given			[L3][CO2]	[5M]
	f(25)=0).2707	, f(30)	=0.30	27, f(3	85)=(0.3386,	f(40)	=0.379	4.					
5	Using Lagrange's interpolation formula, find the value of $y(10)$ from the following table:											he following	[L3][CO2]	[10M]	
	x 5 6 9 11														
		у	1	2	13		14		16						
6	The values	$\frac{1}{(2)}$	unctio	on f(x)	are gi	ven l	below fo	or cei	tain va	lues	of x.	Fi	nd the	[L1][CO2]	[10M]
		r		$\frac{1}{1}$	1	101	2		<u></u> Д						
				5	1 6		3 4 50 105			_					
7	By method		l ·	Jaros f	U it a str	aight	June to	the f	allowin	 a.do	ita ·			[] 3][CO2]	[10]/[]
/	X	1	isi syu	2		aigiil	4		<u>510 will</u>		па,				
	V	14		27)	55	-+	68	-					
	L *	14					55		00						
8	Fit a straig	ht line	y = a	$ax+b_{f}$	or the f	follo	wing data	a						[L3][CO2]	[10M]
		Х	6	7	7	8	8	8	9	9	10				
		Y	5	5	4	5	4	3	4	3	3				

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R23 Fit a second degree polynomial to the following data by method of least square [L3][CO2] [10M] Х 1 2 3 4 0 2.5 у 1 1.8 1.3 6.3 Obtain a second degree polynomial to the data by method of least square [L3][CO2] [10M] Х 1 2 3 4 5 10 12 8 10 Y 14 [L1][CO2] [10M] Find the curve of best fit of the type $y = ae^{bx}$ to the following data by method of least squares

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<u>UNIT –III</u>

SOLUTION OF INITIAL VALUE PROBLEMS TO ORDINARY DIFFERENTIAL EQUATIONS

1	a) Write Taylor's formula for $y(r)$ to solve $y' - f(r, y)$ with $y(r) - y$	[I_1][CO3]	[2]
T	a) write rayior s formula for $y(x_1)$ to solve $y = f(x, y)$ with $y(x_0) = y_0$.		L≝ıvıj
	b) State Euler formula to solve $y' = f(x, y)$, $y(x_0) = y_0$ at $x = x_0 + h$.	[L1][CO3]	[2M]
	c) Find $y^{(1)}(x)$, by Picard's method, given that $\frac{dy}{dx} = 1 + xy$; $y(0) = 1$.	[L1][CO3]	[2M]
	d) If $\frac{dy}{dx} = y - x$; $y(0) = 2$, $h = 0.2$ then Find the value of k_1 in R–K method of	[L1][CO3]	[2M]
	iourth order.		
	e) Write the formula for Runge – Kutta method of fourth order.	[L1][CO3]	[2M]
2	Tabulate $y(0.1)$, $y(0.2)$ and $y(0.3)$ using Taylor's series method	[L3][CO3]	[10M]
	given that $y^1 = y^2 + x$ and $y(0) = 1$		
3	Solve $y^1 = x + y$, given $y(1) = 0$ find $y(1.1)$ and $y(1.2)$ by Taylor's series method.	[L3][CO3]	[10M]
4	Find an approximate value of y for $x = 0.1$ by Picard's method,	[L1][CO3]	[10M]
	given that $\frac{dy}{dx} = x + y$, $y(0) = 1$.		
5	Find the values of $y(0, 1)$ and $y(0, 2)$ by Picard's method given that $y^1 = y - x^2$, $y(0) = 1$.	[L1][CO3]	[10M]
6	Solve by Euler's method $\frac{dy}{dx} = \frac{2y}{x}$ given y(1)=2 and find y(2) and y(3).	[L3][CO4]	[10M]
7	Solve by Euler's method $y' = y^2 + x$; $y(0) = 1$.and find $y(0.1)$ and $y(0.2)$	[L3][CO4]	[10M]
8	Using modified Euler's method find $y(0.2)$ and $y(0.4)$, given $y^1 = y + e^x$, $y(0) = 0$	[L3][CO4]	[10M]
9	Using Runge – Kutta method of fourth order, compute $y(0.2)$ from $y^1 = xy$; $y(0) = 1$, taking $h = 0.2$	[L3][CO4]	[10M]
10	Using Runge – Kutta method of fourth order, solve $\frac{dy}{dx} = x^2 - y$, $y(0) = 1$.	[L3][CO4]	[10M]
	Find $(0, 1)$ and $y(0, 2)$.		
11	Using Runge – Kutta method of fourth order, find $y(0.1)$ and $y(0.2)$ given that $\frac{dy}{dx} = x + y$, $y(0) = 1$.	[L3][CO4]	[10M]

<u>UNIT –IV</u> ESTIMATION AND TESTING OF HYPOTHESIS, LARGE SAMPLE TESTS

1	a) Define Population and size of population.	[L1][CO5]	[2M]
	b) Define Sample	[L1][CO5]	[2M]
	c) Define Estimator.	[L1][CO5]	[2M]
	d) Define point of estimator and interval estimator.	[L1][CO5]	[2M]
	e) Define unbiased estimator.	[L1][CO5]	[2M]
2	a)What is more efficient unbiased estimator?Explain Breifly.	[L4][CO5]	[5M]
	b)A random samples of 400 items is found to have mean 82 and S.D of 18. Find the maximum error of estimation at 95% confidence interval.Find the confidence limits for the mean if $x = 82$.	[L4][CO5]	[5M]
3	a) Define Parameters and Statistics.	[L1][CO5]	[5M]
	b) The mean and the S.D of a population are 11,795 and 14054 respectively. If $n = 50$, Find 95% confidence intervals for the mean.	[L4][CO5]	[5M]
4	a) A random sample size 81 was taken whose variance is 20.25 and mean is 32,Construct 98% confidence interval.	[L4][CO5]	[5M]
	b) Explain procedure for testing a hypothesis.	[L3][CO5]	[5M]
5	a) Explain Errors of Sampling.	[L3][CO5]	[5M]
	b) Explain characteristics of Estimators.	[L3][CO5]	[5M]
6	a)A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40.Test whether the sample has come from a population with mean 38.	[L4][CO5]	[5M]
	b) The means of two large samples of sizes 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches .	[L2][CO5]	[5M]
7	a) It is claimed that a random sample of 49tyres has a mean life of 15200 km. This sample was drawn from a population whose mean is 15150kms and standard deviation of 1200 km. Test the significance at 0.05 level.	[L4][CO5]	[5M]
	b)Samples of students were drawn from two universities and from their weights in kilograms, mean and standard deviations are calculated and shown below. Make alarge sample test to test thesignificance of the difference between the means.	[L4][CO5]	[5M]
	University A 55 10 400		
	University B 57 15 100		
8	a) In a random sample of 125 cool drinkers 68 said they prefer thumsup to	[L4][CO5]	[5M]
	pepsi. Test thus null hypothesis $P = 0.5$ against the alternative hypothesis is $P > 0.5$		
	b) On the basis of their total scores, 200 candidates of a civil service examination are divided in to two groups, the upper 30% and the remaining 70%.consider the first question of the examination. Among the first group,40 had correct answer, whereas among the second group, 80 had correct answer. On the basis of these results, can one conclude that the first question is not good at discriminating ability of the type being examined here?	[L3][CO5]	[5M]
9	a) A die was thrown 9000 times and of these 3220 yielded a 3or 4. Is this consistent with the hypothesis that the die was unbiased?	[L4][CO5]	[5M]

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	b)In two large populations, there are 30%, and 25% respectively of fair haired	[L4][CO5]	[5M]
	people. Is this difference likely to be hidden in samples of 1200 and 900		
	respectively from the two populations?		
10	a)Experience had shown that 20% of a manufactured product is of top	[L4][CO5]	[5M]
	quality. In one day's production of 400 articles only 50 are of top quality.		
	Test the hypothesis at 0.05 level.		
	b) A sample of 400 items is taken from a population whose standard deviation	[L4][CO5]	[5M]
	is 10. The mean of the sample is 40. Test whether the sample has come from a		
	population with mean 38. Also calculate 95% confidence interval for the		
	population.		
11	a)In a big city 325 men out of 600 men were found to be smokers. Does this	[L2][CO5]	[5M]
	information support the conclusion that the majority of men in this city are		
	smokers?		
	b)A sample of 64 students have mean weight of 70 kgs. Can this be regarded	[L2][CO5]	[5M]
	a sample from a population with mean weight 56kgs and standard deviation		
	25kgs.		

							TOP .							
1	a)	Define L	arge s	ample.									[L1][CO6]	[2M]
	b) Define Type I error and Type II error.											[L1][CO6]	[2M]	
	c)	Define le	vel of s	ignificanc	e.								[L1][CO6]	[2M]
	d)	Define nu	ıll hypo	othesis.									[L1][CO6]	[2M]
	e)	Define alt	ternate	hypothesi	s.								[L1][CO6]	[2M]
2	a) A	A sample of	of 26 b	ulbs give	s a me	ean lif	e of 99	0 hou	rs wit	h a S.	D of 2	0	[L4][CO6]	[5M]
	hours. The manufacturer claims that the mean life of bulbs is 1000 hours. Is the sample not up to the standard									rs. Is				
	h)A	$\frac{\text{sample in}}{\text{sample of d}}$	ice are	thrown ?	$\frac{1000}{360}$ tir	nes an	d the f	reque	nev of	- each	sum is		[1.5][CO6]	[5M]
	ind	icated belo	ow:		500 th	nes un	la the i	requei	ley of	cuen	Sum K	,		
		Sun	n	2 3	4	5	6 [′]	7 8	9	10) 11	12		
	** 7	Freque	ency	8 24	35	37	44 6	5 51	1 42	2 26	5 14	14		
	wo 0.0	uid you se 5 level of	iy that signifi	the dice a cant?	are fai	r on ti	ne basi	s of th	e cni-	squar	e test a	it		
3	То	examine t	he hyp	othesis th	nat the	husba	ands ar	e mor	e inte	lligen	t than t	he	[L4][CO6]	[10M]
	wiv	ves, an inv	vestiga	tor took a	samp	le of 1	l0 cou	ples ar	nd adr	ninist	ered th	em a		
	test	which me	easure	s the I.Q.	The r	esults	are as	tollow	/s:					
		Husband	ds 11	7 105	97	105	123	109	86	78	103	107		
		Wives	10	6 98	87	104	116	95	90	69	108	85		
	Test	the hypot	thesis	with a rea	isonab	le test	at the	level	of sig	nifica	nt of 0	.05		
	and	also calc	ulate F	-test.										
4	A random sample of 10 boys had the following I.Q's:										[L1][CO6]	[10M]		
	70, a) D	o these da	ita sup	port the a	ssump	tion o	f a poj	oulatio	n mea	an I.Q	of 100)?		
	b)	Find a re	asonal	ole range	in wh	ich mo	ost of t	he me	an I.Ç) valu	es of			
5	san	ples of 10	0 boys	lie.	n hof		dafta	. intol	a of	0.000	ain de	10 000		[5]\ []
3	a)Bl	en below	sure of	s wome	en belo	ore an	id alle	r intak	e of	a ceri	an ar	ig are		
	0	Before		110	12	0	125	5	132	2	125	5		
		After		120	11	8	125	5	130	5	121	l		
	Tes	t whether	the sig	gnificant	chang	e in bl	lood pi	essure	e at 19	6 leve	el of			
	sigi	nificance.												
	b) Iı	n one sam	ple of	8 observa	tions	the su	m of tl	ne squa	ares o	f devi	iations	of	[L4][CO6]	[5M]
	the	sample va	alues f	rom the s 102.6 T	ample	was ther	34,4 an this dif	d in th	he oth	er san	nples o	of 10 5%		
	leve	el	n was	102.0. 1			uns un		C 15 5.	igiiii	cant at	570		
6	Тч	vo random	n camn	les reveal	l the f	allowi	na regi	1110.					[] 4][CO6]	[10M]
U	1 V	vo rundom	i samp			5110 101	115 1050	1113.						
		Sample	Size	Sample N	Mean	Sum	of squ	ares of	fdevi	ations	from	the		
		1	10	15					$\frac{\text{mean}}{00}$					
		2	10	13				1	108					
	Test whether the samples came from the same normal population.]		

Sample A 24 27 26 21 25 Sample B 27 30 28 31 22 36 Can it be said that the two samples have come from the same normal population. 8 a) A die is thrown 264 times with the following results. Show that the die is [L2][CO6]	
Sample A 24 27 20 21 23 11 Sample B 27 30 28 31 22 36 Can it be said that the two samples have come from the same normal population. 8 a) A die is thrown 264 times with the following results. Show that the die is [L2][CO6]	
Can it be said that the two samples have come from the same normal population. 8 a) A die is thrown 264 times with the following results. Show that the die is	
population. 8 a) A die is thrown 264 times with the following results. Show that the die is	
8 a) A die is thrown 264 times with the following results. Show that the die is [L2][CO6]	
	[5M]
biased. ($\psi^2 = 11.07$ at 5 d.f & 5% L.S)	
Number on the die 1 2 3 4 5 6	
Frequency 40 32 28 58 54 52	
b) Scores obtained in a shooting competition by 10 soldiers before and after [L4][CO6] intensive training are given below:	[5M]
Before 67 24 57 55 63 54 56 68 33 43	
Before 07 24 37 35 05 54 50 08 55 45	
After 70 38 58 56 67 68 75 42 38	
Test whether the intensive training is useful at 0.05 level of significance.	
9 a) Find the maximum difference that we can expect with probability 0.95 [L1][CO6]	[5M]
between the mean of samples of sizes 10 and 12 from a normal population if	
their standard deviations are found to be 2 and 3 respectively.	
b)The following table gives the classification of 100 workers according to [L4][CO6]	[5M]
sex and nature of work. Test whether the nature of work is independent of the mature $(m^2 - 2.84 \pm 1.16)$	
the worker ($\psi^2 = 3.84$ at 10.1)	
Stable Unstable Total	
Males 40 20 60	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	
Total 50 50 100	
10 a) Samples of two types of electrical light blubs were tested for length of life [L2][CO6]	[5M]
and following data were obtained	
Type I Type II	
Sample numbers 8 7	
Sample mean 1234 hrs 1036 hrs	
Sample S.D36 hrs40 hrs	
Is the difference in the means sufficient to warrant that type I is superior to	
type II regarding length of life	
b)The number of automobile accidents per week in a certain community are [L2][CO6]	[5M]
as follows: 12, 8, 20, 2, 14, 10, 15, 6, 9, 4. Are these frequencies in	
this 10 week period	
11 From the following data find whether there is any significant liking in the [I 1][CO6]	[10M]
habit of taking soft drinks among the categories of employees.	[TAN14]
Soft Drinks Clerks Teachers Officers	
Pepsi 10 25 65	
Thums up 15 30 65	
Fanta 50 60 30	

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