LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

U.G. DEGREE EXAMINATION – **ALLIED**

FIRST SEMESTER – **NOVEMBER 2024**

UMT 1302 –

MATHEMATICS FOR CHEMISTRY, MATHEMATICS FOR CHEMISTRY - I

Date: 20-11-2024 Dept. No. Max. : 100 Marks

Time: 09:00 am-12:00 pm

	SECTION A - K1 (CO1)	
	Answer ALL the Questions -	**(10 x 1 = 10)**
1.	**Answer the following**	
a)	Define saddle point.	
b)	List any three series expansions used to solve infinite series.	
c)	Find the integration of $\frac{x}{x^2+1}$ with respect to x.	
d)	Recall and write the expansion of $\cos n\theta$.	
e)	Define Binomial distribution.	
2.	**Fill in the blanks**	
a)	The derivative of $\log_e(e¿¿x)¿$ is recognized as _____	
b)	The expansion of $(1-x)^n$ can be stated as _____.	
c)	Bernoulli's formula for integration is _____.	
d)	If $x=cos\theta+isin\theta$, then $x^n-\frac{1}{x^n}$ can be identified as _____.	
e)	The formula for repeated rank correlation is _____.	
	SECTION A - K2 (CO1)	
	Answer ALL the Questions	**(10 x 1 = 10)**
3.	**MCQ**	
a)	The formula for polar subnormal is (i)2 $\frac{d\theta}{dr}$ (ii) $\frac{dr}{d\theta}$ (iii) (-1) $\frac{d\theta}{dr}$ (iv) $\frac{d\theta}{dr}$	
b)	The series $\frac{\frac{1}{1!}+\frac{1}{3!}+\ldots}{\frac{1}{2!}+\frac{1}{4!}+\ldots}$ is equal to (i) $\frac{e+1}{e-1}$ (ii) $\frac{e+1}{e+2}$ (iii) $\frac{e-1}{e+1}$ (iv) $\frac{e+2}{e-1}$	
c)	The value of $(i)^{96}$ is: (i) 1 (ii)-1 (iii) -i (iv) i	
d)	A correlation between x and y is said to be uncorrelated if (i) $\gamma(x,y)=-1$ (ii) $\gamma(x,y)=+1$ (iii) $\gamma(x,y)=0$ (iv) None of the above	
e)	The value of $\int_0^{\frac{\pi}{2}} \cos^6 x dx$ is: (i) $\frac{5}{32}$ (ii) $\frac{5\pi}{32}$ (iii) $\frac{7\pi}{32}$ (iv) $\frac{7}{32}$	
4.	**True or False**	
a)	Polar subtangent is given by $r\frac{d\theta}{dr}$.	
b)	The function $tanx$ is an odd function.	

c)	Logarithmic series is a finite series.
d)	The terms are alternatively positive and negative in the expansion of $\cos n\theta$.
e)	Correlation coefficient $\gamma(x, y)$ lies between 0 and 1.

SECTION B - K3 (CO2)

Answer any TWO of the following **(2 x 10 = 20)**

5. Show that the parabolas $y^2=4(x+1)$ and $y^2=36(9-x)$ cut orthogonally

6. State and prove any three properties of definite integrals.

7. Show that $\sin^7\theta=\frac{-1}{64}(\sin 7\theta-7\sin 5\theta+21\sin 3\theta-35 sin\theta)$.

8. Ten competitors in a musical test were ranked by the three judges A, B and C in the following order:

Ranks by A	1	6	5	10	3	2	4	9	7	8
Ranks by B	3	5	8	4	7	10	2	1	6	9
Ranks by C	6	4	9	8	1	2	3	10	5	7

Using rank correlation method, relate which pair of judges has the nearest approach to common likings in music?

SECTION C – K4 (CO3)

Answer any TWO of the following **(2 x 10 = 20)**

9. Show that in the curve $r\theta=a$,the polar subtangent is constant and in the curve $r=a\theta$, the polar subnormal is constant.

10. Select suitable formula and find the expansion of $\cos 6\theta$.

11. Determine the sum to infinity of the series using exponential series expansion $\frac{1}{1!}+\frac{1+5}{2!}+\frac{1+5+5^2}{3!}+\frac{1+5+5^2+5^3}{4!}+\ldots.$

12. Calculate the correlation coefficient between advertisement cost (in thousands) and sales (in lakhs) as per the data given below:

Cost	39	65	62	90	82	75	25	98	36	78
Sales	47	53	58	86	62	68	60	91	51	84

SECTION D – K5 (CO4)

Answer any ONE of the following **(1 x 20 = 20)**

13. Discuss the maxima and minima of the function $f(x, y)=2(x^2-y^2)-x^4+y^4$.

14. (a) Point out the appropriate property of finite integral and evaluate $\int_0^{\frac{\pi}{2}} \log sinx\, dx$.

(b) Evaluate: $\int \frac{(x+7)}{x^2+4x+13}dx$. (10+10)

SECTION E – K6 (CO5)

Answer any ONE of the following **(1 x 20 = 20)**

15. (a) Determine the angle of intersection of the cardioids $r=a(1+cos\theta)$ and $r=b(1-cos\theta)$.

(b) Is $\log\sqrt{12}=1+\left(\frac{1}{2}+\frac{1}{3}\right).\frac{1}{4}+\left(\frac{1}{4}+\frac{1}{5}\right).\frac{1}{4^2}+\left(\frac{1}{6}+\frac{1}{7}\right).\frac{1}{4^3}+\ldots.$ Justify your answer. (10+10)

16. Determine the equations of two lines of regression for the following data.

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

	Also, obtain the estimate of X for Y=70.

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