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M.TECH. DEGREE EXAMINATIONS: MAY / JUNE 2010

Second Semester

BIOTECHNOLOGY

MAT508: Applied Mathematics for Biotechnologists

Time: Three Hours **Maximum Marks: 100**

Answer All the Questions:-

PART A (10 x 2 = 20 Marks)

1. Form the differential equation from the primitive $y=ax^2+bx+c$.
2. Find the P.I of $(D^2 + 4)\ y = \cos 2x$
3. Define Laplace Transform.
4. Obtain the Laplace Transform of "sin 2t – 2t cos 2t".
5. Write the normal equations for fitting a parabola $y=ax^2+bx+c$.
6. Find the binomial distribution for which the mean is 4 and variance is 3.
7. Define Type I error and Type II error.
8. What are the expected frequencies of 2 x 2 contingency table given below?

a	b
c	d

9. Write any two differences between RBD & LSD
10. Why a 2 x 2 Latin square is not possible? Explain.

PART B (5 x 16 = 80 Marks)

11. a) (i) Solve: $(D^2 + 4D + 3)\ y = xe^{3x}$ (8)

(ii) Solve: $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 4y = \cos(\log x)$ (8)

(OR)

b) (i) Solve: $(x + 2)^2 \frac{d^2y}{dx^2} - (x + 2) \frac{dy}{dx} + y = 3x + 4$ (8)

(ii) Solve: $\frac{dx}{dt} + y = \sin t$ and $\frac{dy}{dt} + x = \cos t$ given $x = 2,\ y = 0$ when $t=0$. (8)

12. a) (i) Find the Laplace transform of the function (8)

$$f(t)=\begin{cases} t, & 0<t<b \\ 2b-t, & b<t<2b \end{cases} \qquad with f(t+2b)=f(t)$$

(ii) Find $L^{-1}\ \dfrac{2(s+1)}{(s^2+2s+2)^2}$ (8)

(OR)

b) (i) Using convolution theorem to find $L^{-1}\ \dfrac{1}{s^2(s+3)}$ (8)

(ii) Find the Laplace transform of $e^{-t}\int_0^t t\cos t\,dt$. (8)

13. a) (i) Calculate the correlation coefficient for the following data: (8)

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

(ii) Find mean and standard deviation of the following: (8)

Series	Frequency	Series	Frequency
15-20	2	45-50	20
20-25	5	50-55	17
25-30	8	55-60	16
30-35	11	60-65	13
35-40	15	65-70	11
40-45	20	70-75	5

(OR)

b) (i) Find mean and variance of binomial distribution. (8)

(ii) Fit a curve $y=ax^b$ for the data

x	25	20	12	9	7	5
y	0.22	0.20	0.15	0.13	0.12	0.10

14. a) (i) The heights of six randomly chosen sailors are in inches 63, 65, 68, 69, 71 and 72.
Those of 10 randomly chosen soldiers are 61, 62, 65, 66, 69, 69, 70, 71, 72 and 73.

Discuss the light that these data throw on the suggestion that sailors are on the average taller than soldiers. (8)

(ii) A certain injection administered to each of 12 patients resulted in the following increases of blood pressure:

5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4

Can it be concluded that the injection will be, in general, accompanied by an increase in B.P? (8)

(OR)

b) (i) In a certain sample of 2000 families 1400 families are consumers of tea. Out of 1800 Hindu families, 1236 families consume tea. Use ψ^2 - test and state whether there is any significant difference between consumption of tea among Hindu and Non – Hindu families. (8)

(ii) In a sample of 1000 people in Karnataka 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this state at 1% level of significance? (8)

15. a) Three varieties A, B, C of a crop are tested in a randomoized block design with four replications. The plot yields in pounds are as follows.

A 6	C 5	A 8	B 9
C 8	A 4	B 6	C 9
B 7	B 6	C 10	A 6

Analysis the experimental yield and state your conclusion.

(OR)

b) Analyse the following results of a Latin square experiments.

	1	2	3	4
1	A (12)	D (20)	C (16)	B (10)
2	D (18)	A (14)	B (11)	C (14)
3	B (12)	C (15)	D (19)	A (13)
4	C (16)	B (11)	A (15)	D (20)

The letters A, B, C, D denote the treatments and the figures in brackets denote the observations.

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