

Register No:

M.TECH DEGREE EXAMINATIONS: JUNE 2011

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. Solve: $(D^2 - 4D + 4)y = 0$.
2. Find the particular integral of the differential equation $(D^2 + 1)y = x^3$.
3. If $f(t) = e^{-2t} \sin 2t$, find $L[f'(t)]$.
4. Find $L^{-1}\left[\tan^{-1}\left(\frac{a}{s}\right)\right]$
5. Find the average and the coefficient of range for the following data:-
25, 36, 41, 22, 46, 24, 29, 40, 36, 28, 31, 45, 29, 34
6. What do you mean by correlation analysis?
7. What do you mean by Type I error and Type II error?
8. Write the application of 'F' – test and χ^2 (chi – square test).
9. State any two differences between CRD and RBD.
10. Why a 2 x 2 Latin Square is not possible? Explain.

PART B (5 x 16 = 80 Marks)

11. a) (i) Solve $(x^2 D^2 - 3xD + 4)y = x^2 \cos(\log x)$ (8)
(ii) Solve for x, the simultaneous $\frac{dx}{dt} + 2x - 3y = 5t; \frac{dy}{dt} - 3x + 2y = 2e^{2t}$ (8)
- (OR)**
- b) (i) solve $(D^2 - 2D + 1)y = x e^x \sin x$. (8)
(ii) Solve $\left((2x-1)^2 D^2 - 4(2x-1)D + 8\right)y = 8x$. (8)

12. a) (i) Find the Laplace Transform of (i) $f(t) = \begin{cases} \sin t, 0 < t < \pi \\ 0, t > \pi \end{cases}$ (4)

(ii) $t^2 e^{2t} \cos 2t$ (5)

(ii) Find the Inverse Laplace Transform of $\frac{s}{(s+1)^2 (s^2+1)}$ (7)

(OR)

b) (i) Find the Laplace Transform of $f(t) = \begin{cases} t, 0 < t < 1 \\ 2-t, 1 < t < 2 \end{cases}$ such that $f(t+2) = f(t)$ (8)

(ii) Using Convolution Theorem, find the inverse Laplace Transform of $\frac{1}{(s^2+4)(s^2+9)}$ (8)

13. a) Calculate the mean, median and mode of the following data:

Wages (Rs):	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No of workers:	7	13	18	25	20	12	8

(OR)

b) (i) The data relating to import price(Y) and import quantity (X) in respect of a given commodity are as under:

Y:	2	3	6	5	4	3	5	7	8	7
X:	6	5	4	5	7	10	9	7	8	9

Calculate the coefficient of correlation between X and Y. (8)

(ii) Below are given the figures of production (in thousand quintals) of a sugar factory.

Year	1985	1987	1988	1989	1990	1991	1994
Production ('000)	77	88	94	85	91	98	90

Fit a straight line by the least squares method (8)

14. a) (i) A sample of 100 students is taken from a large population. The mean height of the students in this sample is 160 cm. Can it be reasonably regarded that in the population the mean height is 165 cm and S.D is 10 cm. (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) The mean population of a random sample of 400 villages in Jaipur District was found to be 400 with a standard deviation of 12. The mean population of a random sample of 400 villagers in Meerut District was found to be 395 with a standard deviation of 15. Is the difference between the two districts means statistically significant? (8)
- (ii) 1,000 students at college level were graded accounting to their I.Q. and the economic conditions of their homes. Use Chi square test to find out whether there is any association between economic condition at home and I.Q.

I.Q			
Economic Condition			
	High	Low	Total
Rich	460	140	600
Poor	240	160	400
Total	700	300	1000

Given for Chi Square Table value $\nu = 1$ @ 5% level is 3.84. (8)

15. a) Four different, though supposedly equivalent, forms of a standardized reading achievement test were given to each of 5 students and the following are the scores which they obtained:

	Student 1	Student 2	Student 3	Student 4	Student 5
Form A	75	73	59	69	84
Form B	83	72	56	70	92
Form C	86	61	53	72	88
Form D	73	67	62	79	95

Perform a two-way analysis of variance to test at the level of significance 0.01 whether it is reasonable to treat the forms as equivalent.

(OR)

- b) A farmer wishes to test the effects of four different fertilizers. A, B, C, D on yield of wheat. In order to eliminate sources of error due to variability in soil fertility, he uses

the fertilizers in a Latin Square arrangement as indicated in the following table, where the numbers indicate yields in bushels per unit area.

A18	C21	D25	B11
D22	B12	A15	C19
B15	A20	C23	D24
C22	D21	B10	A17

Perform an analysis of variance to determine if there is a significant difference between the fertilizers at $\alpha = 0.05$ levels of significance.
