

M.Sc. 2nd Semester Examination, 2023

MICROBIOLOGY

PAPER – MCB-203.1 & 203.2

Full Marks : 40

Time : 2 hours

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

PAPER – MCB 203.1

(Biomathematics)

[Marks : 20]

A. Answer any *two* questions from the following : 2×2

1. What is continuous and discrete variables ?
Give example.

(Turn Over)

2. State the utility of sampling in statistical analysis.
3. What do you mean by standard error of any distribution ?
4. Define D and Z value.

B. Answer any *two* questions from the following : 4×2

5. What is specific growth rate ? Explain the Monod kinetics of bacterial growth by mentioning the relation between specific growth rate and substrate concentration. 1 + 3
6. State the differences between 2 + 2
 - (i) Frequency polygon and pie diagram
 - (ii) Median and mode.
7. During the cross of two curly-winged flies, a total of 95 progeny are formed, and among them 60 are curly and 35 are straight-winged. Through a chi-square test determine whether these numbers fit Mendelian 3:1 ratio. (given critical chi-square at $p = 0.05$, $df = 1$ is 3.84).

8. 25% of a group of 80 men and 15% of a group of 120 women were found to be diabetic. What is the mean percentage of diabetics after combining both the group ? In a PG class of 28 students the mean height was calculated as 165 cm. The variance of the distribution was determined as 25cm^2 . Determine the standard deviation of the said distribution.

2 + 2

C. Answer any *one* question from the following : 8×1

9. State the null hypothesis in t-test. Body weight (gram) of 8 male albino and 8 female albino mice are given below. Find whether or not the mean weight of males is significantly higher than that of females. (Critical t-score : $t_{0.01(14)} = 2.624$).

2 + 6

Male	50	60	57	55	58	56	54	64
Female	48	53	51	56	55	53	52	49

10. At steady state of chemostat, how specific growth rate is related with dilution rate ?

The initial concentration of cell growing unrestricted in a culture is 1.0×10^6 cells/ml. If the specific growth rate of the cells is 0.1 h^{-1} . Determine the time required for the cell concentration to become 1.0×10^8 cells/ml. The D value for *E. coli* is 2 min at 90°C . If starting culture has 10^8 cfu/ml, how long time is needed to kill the entire population at the same temperature? 1 + 4 + 3

PAPER – MCB 203.2

(*Bioinformatics*)

[Marks : 20]

D. Answer any *two* questions : 2 × 2

11. Name one genomic and one proteomic from where sequences can be retrieved ?
12. Differentiate between local and global alignment.
13. What is systems biology ?

14. What is gap opening and gap extension penalty ?

E. Answer any *two* questions : 4 × 2

15. Write a note on substitution matrix.

16. Briefly describe Smith-Waterman algorithm.

17. Align the following protein sequences (S1 and S2) and calculate the score

S1-MLATYKLGHNNGGAILTWKYAAGLPAG

S2-MMATYKLGHNNGTWKGLYAG

Match score: 1, mismatch score: 0, gap opening penalty: -11, gap extension penalty:-1

18. What is EST ? How it differs from GSS ?

F. Answer any *one* question : 8 × 1

19. What is molecular docking ? Name one protein-ligand and one protein-protein docking software. Define pose and binding mode.

Write the basic steps involved in ligand protein docking.

$2 + (1 + 1) + (1 + 1) + 2$

20. What is BLAST? Compare BLAST and Clustal omega search engines. "Local alignment is more informative than global" –critically discuss.

2 + 3 + 3
