Total No. of Questions : 5] **[Total No. of Pages : 4**

P493 **[3825]-102**

M.Sc.

MICROBIOLOGY

MB-502 : Quantitative Biology

(2008 Pattern)

Time : 3 Hours] [***Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat-labeled diagrams wherever necessary.***
4) ***Use of logarithmic and statistical tables, and scientific calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) Attempt **any two** of the following: **[16]**

a) What is kurtosis? Diagrammatically show different types of kurtosis and skewness.

b) Calculate Mode from the following data and interpret the result.

Marks	Number of students
Above 0	80
Above 10	77
Above 20	72
Above 30	65
Above 40	55
Above 50	43
Above 60	28
Above 70	16
Above 80	10
Above 90	08
Above 100	00

P.T.O.

c) When 10 nutrient agar plates were exposed in a special ward of hospital following number of colonies per plate were obtained.
10, 13, 17, 22, 27, 30, 31, 32, 08, 10.

Determine standard deviation and coefficient of variation.

Q2) Attempt **any two** of the following: **[16]**

a) A bag contains 10 black socks and 10 white socks. Two socks are drawn at random one after the other without replacement. What will be the probability that.

i) Both the socks are white?

ii) Both the socks are of different colours?

b) Explain in brief Chemostat growth model.

c) From the following data obtain the regression equation of Y and X.

X	6	2	10	4	8
Y	9	11	5	8	7

Q3) Attempt **any two** of the following: **[16]**

a) There are 64 beds in a garden and 3 seeds of a particular type of flower are sown in each bed. The probability of flower being white is ¼.

Find the number of beds with

i) Three white flowers

ii) No white flowers.

b) Two laboratories A and B carry out independent estimates of fat content in icecream made by a firm. A sample is taken from each batch, halved and the separated halves sent to the two laboratories. The fat content obtained by the laboratories is recorded below. The fat contents are given in grams.

Batch No:	1	2	3	4	5	6	7	8	9	10
Lab A:	7	8	7	3	8	6	9	4	7	8
Lab B:	9	8	8	4	7	7	9	6	6	6

Determine whether there is a significant difference between the mean fat content obtained by the two laboratories A and B?

c) Explain with suitable example simple random sampling and stratified random sampling.

Q4) Attempt **any one** of the following: **[16]**

a) To study the performance of three detergents and three different water temperatures the following whiteness readings were obtained with specially designed equipments. Test whether the three detergents differ in their performance significantly. Perform 2-Way ANOVA and interpret your results.

Water temp.	Detergent A	Detergent B	Detergent C
Cold water	57	55	67
Warm water	49	52	68
Hot water	54	46	58

b) A sample of 1800 people of a certain locality reveals following results about peptic ulcer and classification is made according to age group. Does the data reveal any association between the age group and peptic ulcer?

Age Group	No. of interviews	Peptic ulcer cases
20-25	75	8
25-30	125	15
30-35	225	39
35-40	375	29
40-45	425	29
45-50	275	42
50-55	175	13
55-60	125	13

Q5) Write a short notes on the **any four** of the following: **[16]**

a) Statistic and parameter.

b) Standard error.

c) Type 1, Type 2 error.

d) Normal distribution curve.

e) Application of internet in biology.

■■■

Total No. of Questions : 5] **[Total No. of Pages : 3**

P857 **[3834]-204**

M.C.A. - I (Science Faculty)

COMPUTER SCIENCE

CS-205 : Database Management System

(2008 Pattern) (Sem. - II) (New)

Time : 3 Hours] [***Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) Answer the following: **[8 × 2 = 16]**

a) Define Superkey and candidate key.

b) Explain Referential integrity with example.

c) Explain Aggregate operators.

d) What is data fragmentation?

e) Explain modes of locking.

f) Explain BCNF.

g) Explain ORDER by clause.

h) Compute the closure $X^+$of the set of attribute {A, B}, under the given set of FDs {A→BC, E→CF, B→E, C→EF}

Q2) Attempt any Four. **[4 × 4 = 16]**

a) Explain three levels of data abstraction.

b) Write a short note on normalization.

c) What is multi-version schemes of concurrency control. Explain with suitable example.

d) Write short note on Schedules.

e) What is view? List two reasons why we may choose to define a view.

P.T.O.

Q3) Attempt any Four. **[4 × 4 = 16]**

a) Write a short note on generalization.

b) Explain difference between a weak & strong entity set with suitable example.

c) "Two phase commit protocol can lead to dead lock". Comment.

d) What is cursor? Explain four variable associated with cursor.

e) What are the functions of DBA, regarding database security.

Q4) Attempt any Four. **[4 × 4 = 16]**

a) Consider the following database of Bus transport system. Many buses run on one route. Drivers are allotted to the buses shiftwise.

Bus (Bus-No, Capacity, Depot-Name)

Route (Route-No, Source, Destination, No, of Stations)

Drivers (Driver-No, Driver-Name, Licence-No, Address, D-Age, Salary)
Write following queries in SQL.

i) List the bus numbers which are running from "Kothrud" to "Station" having bus capacity 50.

ii) Find the names and their Licence No. of drivers working on 11-02-2009 in both the shifts.

b) Discuss dependency Preservation with example.

c) Explain multiversion two phase locking.

d) Explain the difference between file oriented system & Database oriented System.

e) Explain overall database structure.

Q5) Attempt the following. **[10]**

a) Case study

'The Profit Bank' offer five types of accounts loan, checking, Premium Savings, daily interest saving & money market. It operates a number of branches & a customer of the bank can have any number of accounts. Accounts can be joint. Construct an E-R diagram for the above information.

i) Identify the entity sets. Relationship sets & their attributes.

ii) Identify the Primary key for each entity set.

iii) Convert E-R diagram into relational database.

b) Attempt any One. **[6]**

i) Consider following non-serial schedule.

T_1	T_2
Read (A)	
A : = A - m.....	Read (A)
	A : = A + n
Write (A)	
Read (B).....	Write (A)
B : = B + m	
Write (B)	

Give two schedules which are serializable to serial schedule $[T_1, T_2]$

ii) Consider the relation scheme R (A,B,C,D,E) and the set of FDs {A→B,C→D,A→E} is the decomposition of R into (ABC), (BCD), (CDE) lossless?

■■■

Total No. of Questions : 5] **[Total No. of Pages : 3**

P859 **[3834]-302**

M.C.A. - II (Under Science Faculty)

COMPUTER SCIENCE

CS-302 : Computer Networks

(2008 Pattern) (Sem. - III) (New)

Time : 3 Hours] [***Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt all of the following: **[8 × 2 = 16]**

a) Define Baseband and Broadband Transmission.

b) What is 1- persistent CSMA?

c) Give the names of the layer which perform the following task in OSI model

i) Allows a process to add synchronization points._____

ii) Provide Encryption technique to carry sensitive data._____

d) What is Bit stuffing?

e) Define Broadcast and point-to-point Networks.

f) What is virtual circuit?

g) What is switched Ethernet?

h) Show the NRZ-I and Manchester Encoding for the bit stream 11001100.

Q2) Attempt *any four* of the following: **[4 × 4 = 16]**

a) Describe Classful Addressing for IPv4. What are it's disadvantages?

b) What are different Transmission Modes? Explain.

P.T.O.

c) Explain the following fields of IEEE 802.3 Mac Frame.

i) Preamble
ii) SFD
iii) Data and Padding
iv) CRC

d) Explain CSMA\CD.

e) Construct a CRC message for M=101001100101& the generator polynomial is $x^5 + x^2 + 1$.

Q3) Attempt *any four* of the following: **[4 × 4 = 16]**

a) What is full Duplex Ethernet? Why there is no need for CSMA\CD on full. Duplex Ethernet LAN?

b) Explain the design issues of the layers.

c) Explain pure slotted ALOHA.

d) Explain 1-bit sliding window protocal.

e) What is wireless communication? Explain any two media used in wireless communication.

Q4) Attempt *any four* of the following: **[4 × 4 = 16]**

a) We have a channel with 4 kHz bandwidth. The SNR for this channel is 64. Find the bit rate & the signal levels.

b) What is Routing? Explain different types of Routing algorithms with examples.

c) Explain OSI Model.

d) What is Controlled Access? Explain Reservation, Polling and Token Passing.

e) Explain the improvement in Gigabit Ethernet over a Fast Ethernet.

Q5) Attempt *any four* of the following. **[4 × 4 = 16]**

a) Compare Circuit, Message & Packet Switching.

b) What is Pipelining? Explain i) Go-back-n ii) Selective Repeat.

c) Differentiate between physical, logical & port addresses.

d) What are the different strategies for transition from IPv4 to IPv6? Explain.

e) What is protocal? Explain the key elements of a protocols.

■■■

Total No. of Questions : 5] **[Total No. of Pages : 4**

P860 [3834]-303

M.C.A. - II (Under Science Faculty)

COMPUTER SCIENCE

CS-303 : Introduction to System Programming and Operating System Concepts

(2008 Pattern) (Sem. - III) (New)

Time : 3 Hours] [***Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt all of the following: **[8 × 2 = 16]**

a) Define: editor. State any two types of editors.

b) What is multithreading? Give pictorial representation of many-to-one multithread model.

c) Define the term: Process Control Block (PCB). Explain any two fields of PCB.

d) State the dining philosophers problem.

e) Define the terms: seek time and latency time.

f) Explain the concept of swapping and lazy swapper.

g) Write a short note on sequencial access method of file.

h) What are the main advantages of multiprocessor systems?

Q2) Attempt any four of the following: **[4 × 4 = 16]**

a) What do you mean by system call? Explain in detail the implementation of system call.

P.T.O.

b) Consider the following set of processes, with the length of CPU burst time and arrival time in miliseconds.

Process	Burst-time	Arrival time
P_1	5	1.5
P_2	1	0
P_3	2	2
P_4	4	3

Illustrate the execution of these processes using pre-emptive SJF CPU scheduling algorithm. Also calculate average waiting time and average turn around time. Also draw Gant chart.

c) What do you mean by process scheduling? Explain the different types of scheduling queues.

d) What is deadlock? Explain the various techniques used to recover from deadlock.

e) State any four differences between paging and segmentation.

Q3) Attempt any four of the following: **[4 × 4 = 16]**

a) Suppose the head of a moving hard disk with 200 tracks numbered 0 to 199 is currently at track 53.If request in queue are:

98, 183, 37, 122, 14, 124, 65, 67. What is total head movement to satisfy these request using following scheduling algorithms.

i) SCAN ii) LOOK

b) Write a short note on deadlock prevention strategies.

c) State the bounded buffer problem. Explain how semaphore can be used to solve bounded buffer problem.

d) Explain the different types of schedulers. Also give the examples of each.

e) What is file? Explain any two ways of providing protection to the file.

Q4) Attempt <u>any four</u> of the following: **[4 × 4 = 16]**

a) Explain any four file operations.

b) Write a note on contiguous memory allocation.

c) Write a note on binary semaphores.

d) Explain the terms:

i) Turnaround Time

ii) Waiting Time

iii) Throughput

iv) Response Time

e) Consider the following sets P, R and E:

$P = \{ P_1, P_2, P_3\}$

$R = \{ R_1, R_2, R_3, R_4\}$

$E = \{ P_1 \rightarrow R_1, P_2 \rightarrow R_3, R_1 \rightarrow P_2, R_2 \rightarrow P_2, R_2 \rightarrow P_1, R_3 \rightarrow P_3\}$

Also consider the following number of instances per resource type:

i) One instance of resource type R_1 and R_3.

ii) Two instances of resource type R_2.

iii) Three instances of resource type R_4.

Construct the Resource-allocation graph for the above problem. Check whether the system is in the deadlock.

Q5) Attempt <u>any four</u> of the following: **[4 × 4 = 16]**

a) What do you mean by race condition? Explain the solution to avoid race condition. Also give the example.

b) Explain the necessary conditions for deadlock to occur.

c) Write a short note on free space management.

d) Write a short note on multilevel feed back queue.

e) Consider the following reference string:

4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5

How many page faults occurs for the following algorithms with 3 page frames.

i) LRU

ii) Optimal page replacement

■■■

Total No. of Questions : 5] **[Total No. of Pages : 4**

P843 **[3834]-32**

M.C.A. - II (Science Faculty)

COMPUTER SCIENCE

CS-302 : Database System Concepts

(2005 Pattern) (Sem. - III) (Old)

Time : 3 Hours] [***Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) A reputed general hospital has decided to computerize their operations. In the hospital many doctors are working. Personal Information of doctors are maintained to get them fixed salary per month. The patients are admitted to the hospital into the room. They are treated by various doctors. Sometimes patients performs certain pathological tests which carried out into the lab.

Construct an E-R diagram for the above database. **[10]**

i) Identify the Entity sets, Relationship sets, and their attributes.
ii) Identify the Primary key for each entity set.
iii) Convert E-R diagram into Relational database.

b) Attempt <u>any one</u> of the following: **[6]**

i) Explain parts of DBMS structure.

ii) What is outer Join explain its types.

Q2) Attempt <u>any four</u> of the following: **[16]**

a) Write a short note on query optimization.

b) Explain following terms-

i) Entity ii) Candidate key
iii) Super key iv) Outer Join

P.T.O.

c) Explain types of functions.

d) What is cursors? Explain bound cursor.

e) What is Deferred update? Explain.

Q3) Attempt any four of the following: **[16]**

a) Explain different techniques for database security.

b) What are problems encountered when transactions run concurrently ? Explain.

c) Explain data Manipulation statements.

d) What is Multi-Valued Dependencies? Explain.

e) Write a note on specialization.

Q4) Attempt any four of the following: **[16]**

a) Consider the following relational database.

supplier (s_no, sname, addr)

parts (p_no, pname, cost)

catalog (s_no, p_no, colour)

Write following queries in Relational Algebra.

i) Find names of all parts whose cost is more than 100 Rs.

ii) Find name of supplier and parts with its colour & cost.

b) What is closure of Attribute set? Explain.

c) Write a note on Relational model constraints.

d) Explain view serializability.

e) Write the following queries in SQL using relations.

Doctor (dno, dname, addr, city)

Patient (opdno, p_name, addr, disease)

Doctor & patient are related with m- m.

i) Find the number of patients visited by “Dr. Joshi”.

ii) Find the number of patients suffering from “Asthama”.

Q5) Attempt <u>any four</u> of the following: **[16]**

a) Consider the following non- serial schedule:

T_1	T_2
READ (A)	
A: = A - m	READ (A)
	A : = A+ n
WRITE (A)	
READ (B)	WRITE (A)
B: = B+ m	
WRITE (B)	

Give two schedule which are serializable to serial schedule [T_1, T_2].

b) The following is list of events in an interleaved execution of set of transactions T_1, T_2, T_3, T_4, with two phase locking protocol.

Time	Transaction	Code
t_1	T_2	Lock (A,S)
t_2	T_2	Lock (B,X)
t_3	T_3	Lock (C,X)
t_4	T_4	Lock (A,S)
t_5	T_1	Lock (C,X)
t_6	T_2	Lock (A,S)
t_7	T_3	Lock (D,X)
t_8	T_4	Lock (B,S)

Construct a wait- for graph according to above request. Is there deadlock at any instance? Justify.

c) Following are log entries at the time of system crash.

[Start_transaction, T_1]
[Write_item, T_1, A, 5]
[Commit, T_1]
[Start_Transaction, T_2]
[Write_item, T_2, B, 10]
[Write_item, T_2, D, 6]
[Commit, T_2]
[Checkpoint]
[Start_transaction, T_3]
[Write_item, T_3, B, 20]
[Start_transaction,T_4]
[Write_item, T_4, C, 10]← System crash

If immediate update with checkpoint is used what will be the recovery procedure?

d) Write note on Recovery from Deadlock.

e) Write note on Loss Less Join Decomposition.

■■■

Total No. of Questions : 5] **[Total No. of Pages : 2**

P844 **[3834]-33**

M.C.A. - II (Under Science Faculty)

COMPUTER SCIENCE

CS-303 : Computer Networks

(2005 Pattern) (Sem. - III) (Old)

Time : 3 Hours] [***Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt any Four of the following: **[4 × 4 = 16]**

a) Discuss the design issues for the 'n' layer protocol model.

b) Write a note on static and dynamic channel allocation in LANs and MANs.

c) Explain the various functions performed by the application layer.

d) What do you mean by sliding window protocol? Explain one-bit sliding window protocol.

e) Write a note on OSI transport service primitives.

Q2) Attempt any Four of the following: **[4 × 4 = 16]**

a) Write a note on applications of computer network.

b) What is ALOHA? Explain Pure Aloha and slotted Aloha.

c) What is routing? Explain the various characteristics of routing algorithm.

d) Write a note on simplex stop-and-wait protocol.

e) Explain the role of presentation layer in public networks.

P.T.O.

Q3) Attempt any Four of the following: **[4 × 4 = 16]**

a) Explain the functions of session layer.

b) Write a short note on ISDN system architecture.

c) Explain the performance of the stop-and-wait protocol.

d) Explain any two data compression techniques.

e) Explain the role of session layer in ARPANET.

Q4) Attempt any Four of the following: **[4 × 4 = 16]**

a) Write a note on hierarchical routing.

b) Write a note on timer-based connection management in transport layer.

c) Discuss RPC.

d) Explain the concept of traditional cryptography.

e) Explain the architecture of electronic mail service.

Q5) Attempt any Four of the following: **[4 × 4 = 16]**

a) Explain the various design issues of transport layer.

b) Write a note on client-server model.

c) Explain the simplex protocol for noisy channel.

d) Write a note on concurrency control.

e) How network layer impliments connectionless and connection oriented services?

■■■

Total No. of Questions : 5] **[Total No. of Pages : 3**

P845 **[3834]-34**

M.C.A. - II (Under Science Faculty)

COMPUTER SCIENCE

CS-305 : System Analysis and Design (Software Engineering)

(2005 Pattern) (Sem. - III) (Old Course)

Time : 3 Hours] [***Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***

Q1) Answer all Eight of the following: **[8×2=16]**

a) List the characteristics of the system.

b) Write a short note on system analyst.

c) Write down the benefits of CASE tools.

d) What are the benefits of prototyping?

e) What is the use of feasibility study?

f) What is the importance of data dictionary?

g) Write a short note on Fractional Approach.

h) State the types of Flowcharts.

Q2) Answer any Four of the following: **[4×4=16]**

a) What is system? Explain the elements of system.

b) Explain different types of system.

c) State the advantages and disadvantages of spiral model in software development.

P.T.O.

d) Write a note on Requirement Investigation.

e) What are the flow charting techniques? Explain each one in detail.

Q3) Answer any Four of the following: **[4×4=16]**

a) Distinguish between fractional approach and Incremental approach.

b) Write a note on Integrated case tools.

c) Compare and contrast between structured interview and unstructured interview.

d) Explain the process of Testing in brief.

e) Write a note on "record review".

Q4) Attempt All of the following: **[2×8=16]**

a) Discuss various Fact Finding techniques in details. Which one to use when.

b) Solve the following.

Draw an E-R diagram for a Bank Where a customer can open many accounts in many branches and an account can belong to more than one customer (Joint Account). Consider appropriate set of attributes.

Q5) Solve any Two of the following: **[2×8=16]**

a) Draw a physical DFD and Logical DFD for order processing system. The activities include:

i) Customer sends in order.

ii) Orders are received by order processing clerk.

iii) Order processing clerk verifies the order for the Material before sending for further processing or rejecting it.

iv) Rejected order will be sent to customer others will be entered into the computer file .

v) Order is processed and an invoice is prepared.

b) As a student of computer course at the post graduate level, you are required to complete a project work involving system analysis and design for a particular problem in a company. Draw content level DFD and First Level DFD for the problem.

c) Explain in Brief.

i) Condition Stub.

ii) Condition Entry.

iii) Action Stub.

iv) Action Entry.

■■■

Total No. of Questions : 5] **[Total No. of Pages : 2**

P1218 **[3834]-51**

M.C.A. - III (Science Faculty)

CS-501 : Mobile Computing

(Sem. - V)

Time : 3 Hours] [***Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to right indicate full marks.***
3) ***Draw diagrams wherever necessary.***

Q1) Attempt any Four of the following: **[16]**

a) Explain architecture of WAP.

b) What are the advantages of wireless LAN.

c) Explain fixed TDMA with its advantages and disadvantages.

d) State advantages and disadvantages of spread spectrum technology.

e) Explain reference model of mobile network.

Q2) Attempt any Four of the following: **[16]**

a) How Indirect -TCP isolates the problems on the wireless link? What are the main drawbacks of this solution?

b) What is the basic purpose of DHCP? Name the entities of DHCP. How can DHCP be used for mobility and support of mobile-IP?

c) Explain four types of multiplexings.

d) Explain MACA (RTS-CTS) protocol.

e) Why reverse tunneling is needed in mobile IP?

Q3) Attempt any Four of the following: **[16]**

a) What is fading? What are the factors in the radio propagation channel influence small scale fading?

b) Explain Direct sequence spread spectrum.

c) Explain CSMA/CA protocol of IEEE 802.11.

P.T.O.

d) Explain purpose of following messages in mobile-IP optimization; binding request, binding update, binding acknowledgement,binding warning.

e) Define: handover, FDD, Shadowing, Multi-carrier Modulation.

Q4) Attempt any Four of the following: **[16]**

a) What are the location dependent services?

b) What is the purpose of analog modulation in wireless networks?

c) What are the advantages of cellular system?

d) Why CSMA/CD fails in wireless network?

e) What are the advantages and disadvantages of mobile-TCP?

Q5) Attempt any Four of the following: **[16]**

a) Explain prioritization and contention phases of HIPERLAN1.

b) Compare FDMA and SDMA.

c) Explain Advanced phase shift keying methods.

d) Explain wireless application environment (WAE).

e) What are the advantages and disadvantages of CDMA?

■■■

Total No. of Questions : 5] **[Total No. of Pages : 2**

P1219 [3834]-52

M.C.A. - III (Under Science Faculty)

COMPUTER SCIENCE

CS-502 : Expert Systems

(Sem. - V)

Time : 3 Hours*]** **[*Max. Marks : 80

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) Attempt any Eight of the following: **[16]**

a) Define expert system.

b) Explain threshold with a suitable example.

c) Explain the differences between frame and script structures.

d) Explain in brief recurrent Networks.

e) Explain the production system.

f) Explain the importance of Decision tree architectures in expert systems.

g) Explain the components of radian rule-master.

h) Explain "Knowledge Acquisition is difficult" in brief.

i) Explain:

i) Generality ii) Robustness

j) Define:

i) Selective induction ii) Deductive learning

Q2) Attempt any Four of the following: **[16]**

a) Write a short note on Intelligent editor.

b) Compare Expert System and Artificial Neural network.

c) Explain Hopfield Network model.

d) Explain the following:

i) Concept ii) Induction

e) Differentiate Monotonic and Non-Monotonic Reasoning.

P.T.O.

Q3) Attempt any Four of the following: **[16]**

a) What do you understand by knowledge base? Give an example to show facts and rules in a simple knowledge base.

b) Differentiate between efficiency and efficacy.

c) Write a short note on perceptron model.

d) What are the factors affecting the learning performance.

e) Write a short note on Boltmann machines.

Q4) Attempt any Four of the following: **[16]**

a) Explain the terms given below:

i) Object ii) Hypothesis iii) Fact iv) Rule

b) Explain with a neat diagram 'Blackboard System Architecture'.

c) Explain what is meant by knowledge representation and knowledge acquisition.

d) Define:

i) Degree of beliefs ii) Goal driven inferences

e) Write a short note on Neural network architecture.

Q5) Attempt any Two of the following: **[16]**

a) Explain Generalization and its rules. Also, explain with an example how generalization is opposite of specialization.

b) Write short notes on:

i) Personal consultant plus

ii) Heuristic programming

c) What is Inductive Bias. Explain with the help of minimum three examples.

■■■

Total No. of Questions : 5] **[Total No. of Pages : 2**

P1220 [3834]-53

M.C.A. - (Science Faculty)

CS-503 : Software Project Management

(2005 Pattern) (Sem. - V)

Time : 3 Hours] [***Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***

Q1) Answer the following: (any Four) **[16]**

a) Discuss configuration management and version controlling system.

b) Explain waterfall model to develop S/W.

c) Discuss data encapsulation with suitable example.

d) What do you mean by system implementation? Discuss steps of system implementation.

e) What makes good S/W architecture? Discuss factors influencing on software architecture.

Q2) Write short note on the following: (any Four) **[16]**

a) Risk Reduction Model.

b) System Development Life Cycle.

c) Reverse Engineering and Re-engineering.

d) CASE Tools.

e) Software Project Management activities.

Q3) Justify the following: **(**any Four**)** **[16]**

a) "Well documented systems are easy to maintain and manage".

b) "Software development should take place on time within budget".

c) "High fan-in is always good, while high fan-out is worst ".

P.T.O.

d) "Changes in software has reflection on its design".

e) "Objects are the fundamental, logical and structural components of the modeling".

Q4) Answer the following: **(**any Four**)** **[16]**

a) Discuss qualities of good S/W.

b) What do you mean by system maintenance? Discuss types of system maintenance.

c) What do you mean by system requirements? "Requirements gathering is a foundation of S/W development activity" comment.

d) Define S/W Engineering and discuss its role in S/W development.

e) Discuss steps in object oriented Analysis and Design.

f) Discuss factors affecting on quality, productivity and cost of S/W.

Q5) Answer the following: (any Two) **[16]**

a) Why code reuse and reusability are promoted? State its advantages and disadvantages.

b) Compare S/W project and S/W product, does S/W maintenance have any impact on its selection.

c) Discuss capability maturity model and its different levels.

■■■

Total No. of Questions : 5] **[Total No. of Pages : 3**

P1221 [3834]-54

M.C.A. (Under Science Faculty)

COMPUTER SCIENCE

CS-504 : Advanced Modeling Techniques

(Sem. - V)

Time : 3 Hours*]** **[*Max. Marks : 80

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) A computerized authoring tool is to be developed so that several authors can write a book simultaneously over a network. A book has several chapters, which in turn will have sections and sub-sections. Authors can add data in form of paragraphs to existing sub-sections, or if needed, add new sub-sections (sections,chapters etc.) Authors can delete (modify) data added by them, but not the data added by other authors but can view data added by all the authors.

However one of the author is designated as editor who can add, modify, delete, paragraphs added by any author. i.e. he can add, remove statements or even words.

Apart from the pages containing the chapters, there are other pages such as preface, foreward, index,references, contents etc. Authors can add these pages or pages already existing can be modified. Consider different aspects of the above problem and model them appropriately. Draw the following diagrams: **[16]**

a) Use case diagram

b) Sequence diagram

c) Class diagram

d) Activity diagram

P.T.O.

Q2) Attempt any Two of the following: **[8]**

a) Explain 'extends' and 'uses' relationship between use cases by giving suitable examples.

b) In what sense UML is unified? How it differs from other languages? Discuss.

c) Discuss the benefits of object-oriented approach.

Q3) State whether true or false. Justify your answer (any Six): **[12]**

a) Life lines in sequence diagram start from the top of the diagram.

b) An event has no duration.

c) Only concrete classes can be leaf classes in the inheritance tree.

d) Entities in ER model are the same as objects in the object model.

e) Associations are implemented as pointers.

f) A subclass cannot have additional attributes over its base class.

g) A data store should have at least one data flow leaving it.

h) System development is an iterative process.

Q4) Attempt any Three of the following: **[12]**

a) Define the following terms

i) UML ii) Model

iii) Event iv) Metaclass

b) Discuss the components of collaboration diagram.

c) Explain Entry and Exit Actions in dynamic model.

d) Discuss the methods of converting a DFD into a structure chart.

e) How classes can be identified from problem statement during analysis? Explain criterias used in discarding un-necessary and in correct classes thus identified.

Q5) Attempt any Four of the following: **[32]**

a) Draw a class diagram and object diagram for 'file transfer system'. Consider the following :

Sender tries to establish a connection to the receiver by sending a start of transaction packet. The receiver success fully reads the packet and replies with an acknowledgement. The sender then transmit a start of a file packet which is acknowledged. Then the data is transmitted in three acknowledged packets followed by EOF and end of transaction which are also acknowledged.

b) Draw a state diagram and activity diagram for considering scenarios for Tea/Coffee making machine.

c) Consider a 'IT' college which felicitates the fourth year students in the annual social gathering for their various achievements as follows:

If the student is a 'Best Artist' he will get an award of, Rs.1000/. If he is 'Best sportsman' he will get an award of Rs. 1,200/-. If he is 'Best scholar' he gets an award of Rs. 2,000/-. If he is 'Best Outgoing student' i-e. One who has received at least two of above awards, he will get a bumper award of Rs. 5,000/-. Draw a sequence diagram and collaboration diagram.

d) Draw a component and deployment diagram for E-Purchasing which is distributed over the network where the users can purchase different items. Specify the functionalities supported by each component .

e) Draw a use-case diagram and class diagram for "MOBILE TECH". They have different distributors at different areas. Different facilities are provided such as incoming calls free, sending E-Mails, Mobile-to-mobile free calls if same companies mobile, songs can be seen etc. Clearly specify the assumptions made.

f) Prepare a DFD for computing the mean of a sequence of input values.A separate control I/P is provided to reset the computation. Each time a new value is input, the mean of all values input since the last reset command should be O/P since you have no way of knowing how many values will be processed between resets, the amount of data storage that you use should not depend on the no. of I/P values. Detail your diagram down to the level of multiplications, division and additions.

■■■

Total No. of Questions : 5] **[Total No. of Pages : 2**

P492

[3825]-101
M.Sc.
MICROBIOLOGY
MB - 501 : Microbial Diversity and Taxonomy
(2008 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat-labeled diagrams wherever necessary.***
4) ***Use of logarithmic tables and scientific calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) Attempt any two of the following : **[16]**

a) Justify : Classification of molds is chiefly based on their morphological characters?

b) Explain the significance of lipid profiles in bacterial taxonomy.

c) Describe the characteristic features of bacterial cell in VBNC state. What is resusitation.

Q2) Attempt any two of the following : **[16]**

a) Justify : The 16S rRNA is the most widely accepted 'Molecular Chronometer' in bacterial taxonomy.

b) Explain the various culture independent molecular methods used in bacterial taxonomy.

c) Describe the pair wise dynamic programming and gap penalties in sequence alignment.

Q3) Attempt any two of the following : **[16]**

a) Outline the strategy for identification of pure cultures with suitable flow sheet diagram.

b) Explain the need and techniques of extracting total bacterial DNA from a habitat.

c) Describe the significance of databases in proteomic and genomic analysis.

P.T.O.

Q4) Write short notes on <u>any four</u> of the following : **[16]**

a) Protein profiles in taxonomy.

b) Methods to determine the extent of DNA hybridization.

c) Application of FISH in bacterial diversity.

d) Compare PSI-BLAST and PHI-BLAST.

e) Environmental clone libraries.

Q5) The taxonomic resolution of some currently used techniques is shown below. Assess whether the resolutions are correct or not. If not, redraw the diagram with the correct resolutions, and explain your answer. **[16]**

Restriction fragment length polymorphism

DNA-DNA hybridization

Ribotyping

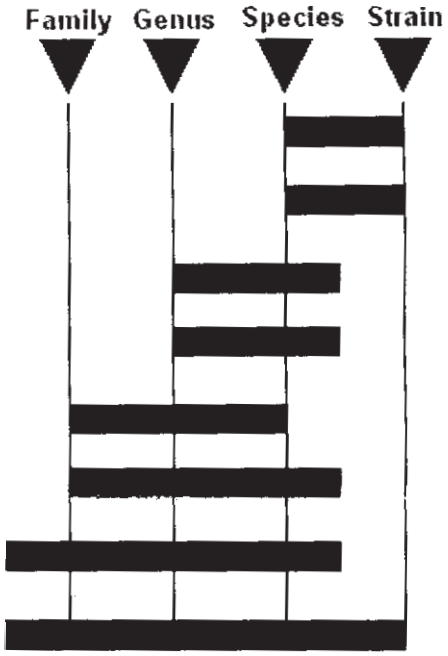
Chemotaxonomic markers (quinones)

% G + C

FAME

DNA sequencing

rRNA sequencing



☒☒☒☒

Total No. of Questions : 5] **[Total No. of Pages : 2**

P494

[3825] - 103

M.Sc.

MICROBIOLOGY

MB-503: Cell Organization and Biochemistry

(2008 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Draw neat labelled diagrams wherever necessary.***
3) ***Use of logarithmic tables and scientific calculators is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) Attempt **any two** of the following: **[16]**

a) Describe the structure and function of actin filaments.

b) Give mechanism of inhibition of cell wall synthesis by penicillin.

c) Describe communication in myxobacteria.

Q2) Attempt ***any two*** of the following: **[16]**

a) Wool and silk are both composed of fibrous proteins. Explain why wool can stretch and shrink while silk cannot.

b) Explain various types of isomerism observed in sugars.

c) Explain the role of morphogen gradients in *Drosophilla*.

Q3) Attempt ***any two*** of the following: **[16]**

a) Diagrammatically illustrate the protein import in mitochondria.

b) Justify "The control system can arrest the cell cycle at specific check points".

c) Describe one method each for detection and quantitative estimation of DNA.

P.T.O.

Q4) Write short notes on ***any four*** of the following: **[16]**

a) Retinaldehyde.

b) Biological buffers.

c) Non-covalent interactions.

d) MPF.

e) Applications of biofilms.

Q5) a) Determine the sequence of hexapeptide based on the following data. **[10]**

i) Amino acid composition was found to be: (2Arg+Ala+Ser+Val+Tyr)

ii) Sanger's reagent gave DNP - Ala.

iii) Trypsin digestion gave two peptides with amino acid composition: (Arg+Ala+Val) and (Arg+Ser+Tyr).

iv) Carboxypeptidase A digestion: No digestion.

v) Chymotrypsin digestion: (Ala+Arg+Val+Tyr) and (Arg+Ser).

b) Predict the direction of migration of peptide Lys-Gly-Ala-Glu during electrophoresis at pH 2,4,6 and 11, using the information provided in the table. **[6]**

Amino acid	**p*ka* α-COOH**	**p*ka* α-NH_3^+**	**p*ka* R**
Lysine	2.2	9.0	10.5
Glycine	2.3	9.6	-
Alanine	2.4	9.7	-
Glutamic acid	2.2	9.7	4.3

Total No. of Questions : 5] **[Total No. of Pages : 2**

P495

[3825] - 201

M.Sc.

MICROBIOLOGY

MB - 601 : Instrumentation and Molecular Biophysics

(2008 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Attempt ***any two*** of the following: **[16]**

a) Explain the principle and working of Gas Chromatography. Given naphthalene (boiling point = 218ºC), phenol (boiling point = 181.7ºC) and toluene (boiling point = 110.6ºC), giving reasons, state which compound will elute first on a non-polar column.

b) Explain the principle of Ion-Exchange Chromatography. A certain peptide has pI of 5.2. Which ion exchange stationary phase would be used to separate it from impurities in a buffer at pH 6 and why?

c) What is the principle of SDS-PAGE? Explain in detail, how is it different from Native PAGE?

Q2) Attempt ***any two*** of the following:- **[16]**

a) Explain the principle of X-ray Diffraction. Give the basic lattice planes found in a crystal. How does reciprocal lattice help in determining the structure?

b) Describe the working of NMR spectroscopy. Justify "NOESY is a through space effect and can be used to determine the spatial separation between nuclear spins".

c) Give the instrumentation of Mass Spectroscopy. How is Mass Spectrometry applied to analyze the protein molecules to separate and determine their individual characteristics?

P.T.O.

Q3) Attempt ***any two*** of the following: **[16]**

a) What is the principle underlying Chou-Fasman method? How do propensities of amino acids help in predicting secondary structure?

b) What are the properties of peptide bond? What are torsional angles? How is Ramchandran Plot useful in predicting structure of protein?

c) Give the principle of Pulse-Chase Experiment. Explain with example.

Q4) Write short notes on ***any four*** of the following: **[16]**

a) Fluorescence Spectroscopy.

b) MALDI- TOF.

c) Molar Extinction Coefficient.

d) Liquid scintillation counting.

e) Ultra centrifugation.

Q5) Solve: **[16]**

a) Two analytes A and B were separated on a 25 cm long column. The observed retention time were 7 min 20s and 18 min 20s, respectively. The σ (standard deviation) of base peak width for analyte B was 10s. When a reference compound, which was completely excluded from the stationary phase under the same elution conditions, was studied, its retention time was 1 min 20s. What was the resolution of the two analytes?

b) A fixed angle rotor exhibits a minimum radius r_{min} at the top of centrifuge tube of 3.5 cm and a max radius r_{max} at bottom of tube of 7.0 cm. If the rotor is operated at speed of 20,000 rpm, what is relative centrifugal force (RCF) at the top and bottom of centrifuge tube?

c) Beckman ® JA-10 rotor is used and the time taken to pellet the sample is 20 mins. With the new rotor Sorvall ® SLC-1500 the k factor has been decreased from 3610 to 1676. How much time would it take for the same sample to pellet with the new rotor?

Total No. of Questions : 5] **[Total No. of Pages : 2**

P496

[3825] - 202

M.Sc.

MICROBIOLOGY

MB - 602 : Evolution, Ecology and Environmental Microbiology

(2008 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Attempt ***any one*** of the following. **[16]**

a) Describe the role of anaerobic heterotrophs in wastewater treatment. Explain the operating parameters for UASB digester.

b) Discuss the concept of evolutionary r and k selection. Elaborate on the various regulatory factors.

Q2) Attempt ***any two*** of the following:- **[16]**

a) Enlist the various chemical agents used in flocculation process. Explain how these chemicals manifest floccules formation.

b) Explain the different sedimentation phenomena observed during the process of settling of solids.

c) Describe the growth and distribution patterns of marine microplankton, and its regulation by environmental conditions.

Q3) Attempt ***any two*** of the following. **[16]**

a) Describe the various agencies involved in speciation of sexual and asexual organisms.

b) Discuss the functional capabilities of mycorrhizal associations.

c) Justify that the plant root exudates regulate the microbial populations in the rhizosphere.

P.T.O.

Q4) Write ***short notes*** on ***any four*** of the following: **[16]**

a) Anoxic denitrification.

b) Microbial bleaching of dyes.

c) Bioremediation.

d) Proteinase inhibitors as plant defense agents.

e) Significance of selfish gene in evolution.

Q5) A single-stage tricking filter has a diameter of 12.0 m and depth of 6.5 m. The characteristics of primary effluent wastewater to be treated by this filter are as follows: **[16]**

Flow rate: 3500 m^3/d

BOD: 110 mg/L

TSS: 75 mg/L

TKN: 20 mg/L

Determine the following:

a) BOD loading rate.

b) TKN loading rate.

c) BOD removal efficiency.

d) Can nitrification be expected?

Total No. of Questions : 5] **[Total No. of Pages : 2**

P497

[3825] - 203

M.Sc.

MICROBIOLOGY

MB - 603 : Microbial Metabolism

(2008 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***Use of logarithmic tables and scientific calculators is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) Attempt ***any two*** of the following. **[16]**

a) What are coupled reactions? Discuss the significance of high energy compounds in such reactions.

b) Derive the equation for two- substrate enzyme catalyzed reaction with double displacement mechanism.

c) Explain the concept of anaerobic respiration with suitable example.

Q2) Attempt ***any two*** of the following:- **[16]**

a) Justify: ATP/NADPH ratio regulates the functioning of cyclic photophosphorylation.

b) Justify: Heterotrophic aerobes are more energy efficient than chemolithotrophs.

c) With the help of suitable example explain the role of allosteric enzymes in metabolism.

Q3) Attempt ***any two*** of the following. **[16]**

a) Diagrammatically illustrate shuttle systems across mitochondrial membrane.

b) Describe biosynthesis of purine nucleotides.

c) Explain regulation of glutamine synthetase.

P.T.O.

Q4) Write short notes on ***any four*** of the following: **[16]**

a) Regulation of Calvin cycle.

b) Structure of Na^+- K^+ ATPase.

c) Gibb's free energy.

d) Liposomes.

e) Substrate inhibition.

Q5) Solve

a) The following kinetic data were obtained for an enzyme in the absence of inhibitor (1), and in presence of inhibitor (2). Assume that (E_T) is same for both experiments. Determine the V_{max} and K_m for the enzyme in presence and absence of inhibitor and comment on type of inhibition. **[10]**

[S] mM	(1) V (μmol/mL.sec)	(2) V(μmol/mL.sec)
1	12	4.3
2	20	8
4	29	14
8	35	21
12	40	26

b) The conversion of glucose to lactic acid has an overall $\Delta G^{o'}$ of -52 Kcal/mole. In an anaerobic cell this conversion is coupled to the synthesis of 2 moles of ATP per mole of glucose. If ATP hydrolysis releases 7.7 kcal/mole of energy, calculate the $\Delta G^{o'}$ of overall coupled reaction and the efficiency of energy conversion in the aerobic cell. **[6]**

Total No. of Questions : 5] **[Total No. of Pages : 2**

P498

[3825] - 301
M.Sc.
MICROBIOLOGY
MB - 701 : Immunology
(2008 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Neat well labelled diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables and electronic pocket calculators is allowed.***
5) ***Assume suitable data if necessary.***

Q1) Attempt ***any two*** of the following. **[16]**

a) Justify, "The ancient system of innate immunity evolved as adaptive immunity in vertebrates."

b) Explain establishment and maintenance of central and peripheral tolerance.

c) Explain how anti-idiotypic antibodies can be used as vaccines with a suitable example.

Q2) Attempt ***any two*** of the following. **[16]**

a) Justify, "Nude mice and humans with Degeorge's syndrome cannot mount CMI."

b) Justify, "Superantigens can activate a large number of T cells irrespective of the antigenic specificity."

c) Schematically explain the structure of TCR-CD3 complex and discuss the significance of ITAM.

Q3) Attempt ***any two*** of the following. **[16]**

a) Justify, "*Mycobacterium tuberculosis* does not mount an antibody response where as *Staphylococcus aureus* mounts an antibody response."

b) Justify, "IgA and complement deficiency causes SLE."

c) What are the potential escape mechanisms of tumours from host defence?

P.T.O.

Q4) Attempt ***any four*** of the following. **[16]**

a) Animal model for AIDS.

b) SCID.

c) CEA.

d) Nitroblue tetrazolium test.

e) T reg cells.

Q5) A CD8+ CTL clone (from an H-2^k mouse) has a T cell receptor specific for the H-Y antigen. $\alpha\beta$ TCR genes were cloned from this cell line and used them to prepare transgenic mice with the H-2^k or H-2^d halotype. **[16]**

a) How can you distinguish immature thymocytes from mature CD8+ thymocytes in the transgenic mice?

b) For each transgenic mouse listed in the table below, indicate with (+) or (–) whether the mouse would have immature double positive and mature CD8+ thymocytes bearing the transgenic T cell receptor.

Transgenic mouse	Immature thymocytes	Mature CD8+ thymocytes
H-2^k female		
H-2^k male		
H-2^d female		
H-2^d male		

Total No. of Questions : 5] **[Total No. of Pages : 2**

P499

[3825] - 302

M.Sc.

MICROBIOLOGY

MB - 702 : Molecular Biology - I

(2008 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***Use of logarithmic tables and electronic pocket calculators is allowed.***
5) ***Assume suitable data if necessary.***

Q1) Attempt ***any two*** of the following. **[16]**

a) List the proteins that are involved in DNA replication and comment on their known and putative functions.

b) What are proto-oncogenes? How do RB proteins play an important role in suppression of cancer?

c) How is the controlling of transposition achieved in the case of Tn10 element.

Q2) Attempt ***any two*** of the following:- **[16]**

a) Explain post replication repair mechanisms in *E.coli*.

b) Describe the regulation of eukaryotic replication.

c) Explain gene conversion with an example.

Q3) Attempt ***any two*** of the following. **[16]**

a) Explain how the Ruv system resolves Holiday junction?

b) What are the structural and functional differences between Tn elements and Ty elements?

c) Explain how retroviruses are involved in cancer formation?

P.T.O.

Q4) Write short notes on *any four* of the following: **[16]**

a) src kinase.

b) LINES.

c) Mutation rate.

d) SOS operon.

e) Transcription coupled repair.

Q5) a) In a series of 94,075 babies in particular hospital in Copenhagen, 10 were achondroplastic dwarfs (this is an autosomal dominant condition). Two of these 10 had an achondroplastic parent. The other 8 achondroplastic babies each had two normal parents. What is the apparent mutation rate at the achondroplasia locus? **[8]**

b) You have a culture of normal cells and a culture of cells dividing uncontrollably (isolated from a tumor). Experimently, how would you determine whether uncontrolled growth was the result of an oncogene or a mutated pair of tumor suppressor alleles? **[8]**

Total No. of Questions : 5] **[Total No. of Pages : 2**

P500

[3825] - 303

M.Sc.

MICROBIOLOGY

MB - 703 : Virology

(2008 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***Use of log tables and electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) Attempt *any two* of the following: **[16]**

a) How does TMV multiply in leaves of tobacco plant?
b) Explain *in ovo* technique for cultivation of viruses.
c) Explain how bacteriophage Lambda establish a lysogenic state in *E-coli*.

Q2) Attempt *any two* of the following: **[16]**

a) Explain criteria used in ICTV classification of viruses.
b) Comment on : vector control as preventive measure for viral infections of plants.
c) Comment on need for modern viral vaccines.

Q3) Attempt *any two* of the following: **[16]**

a) Describe the pathophysiology of infections caused by Simian virus 40.
b) Give a protocol for screening of antivirals.
c) Justify - "Fluorescent microscopic techniques are better than electron microscopy in detection of viral infections."

Q4) Write short notes on *any four* of the following: **[16]**

a) Nucleic acid probes.
b) Oncogenic viruses.
c) Indicator plants for viral studies.
d) Phage therapy for poultry diseases.
e) Cellular sites for viral multiplication.

P.T.O.

Q5) Answer the following.

a) 10^6 cells of *Salmonella* sp. were exposed to phage p_{22} and incubated at 37ºC. At the end of the incubation period there were 10^4 infected cells. Calculate the multiplicity of infection in this experiment. **[6]**

b) A sample of **Newcastle disease virus** stored at 4ºC was sent to the laboratory for determination of infectivity in eggs. 0.1 ml sample was serially diluted and injected into a set of 5 eggs for each dilution.

Following data shows results of titration of **Newcastle disease virus for infectivity i**n eggs. **[10]**

Dilution of virus	Number of eggs infected (HA+)
10^{-7}	5
10^{-8}	4
10^{-9}	2
10^{-10}	0

From the data given above, calculate

i) Index

ii) Determine EID_{50} value per ml of the sample.

Total No. of Questions : 5] **[Total No. of Pages : 2**

P501

[3825] - 401

M.Sc.

MICROBIOLOGY

MB - 801 : Pharmaceutical and Medical Microbiology

(2008 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw diagrams wherever necessary.***
4) ***All questions carry equal marks.***
5) ***Use of the logarithmic, electronic pocket calculator is allowed***
6) ***Assume suitable data if necessary.***

Q1) Answer *any one* of the following: **[16]**

a) Explain the bioprospecting phases involved in discovery of the drug.

b) Describe the rational drug design approach to drug discovery.

Q2) Answer *any two* of the following: **[16]**

a) Explain the Paul Ehlrich's Postulates.

b) Brief the phases of clinical trials for a drug.

c) Comment on the role of evasins in bacterial virulence.

Q3) Answer *any two* of the following: **[16]**

a) Describe the laboratory methods used to assess antimicrobial activity.

b) Write the mode of actions of exotoxin with example.

c) Explain the carcinogenicity testing of drugs.

Q4) Write short notes on *any four:* **[16]**

a) Ames test.

b) Mutagenecity testing.

c) High throughput screening.

d) Pharmakogenomics.

e) Micronuclease test.

P.T.O.

Q5) Below table shows susceptibility of *C.albicans* from a local hospital as determined by the CLSI microdilution and E test.

Antifungal agent	MIC(mg/L)							
	Range		MIC_{50}		MIC_{90}		Percent resistant	
	CLSI	E test	CLSI	E test	CLSI	E test	CLSI	E test
Amphotericin B	0.25-1	0.063-0.5	0.5	0.25	0.5	0.25	0	0
Flucytosine	≤0.125->64	≤0.125->64	≤0.125	0.25	0.5	1	3.2	3.6
Fluconazole	≤0.125-4	≤0.125-2	≤0.125	0.25	0.5	0.5	0	0

a) Describe the development of resistance mechanism in fungi. **[8]**

b) Comment on the scientific data above with reference to resistance and sensitivity. **[4]**

c) Define, MIC, MIC_{50}, MIC_{90}, MBC. **[4]**

Total No. of Questions : 5] **[Total No. of Pages : 2**

P502

[3825] - 402

M.Sc.

MICROBIOLOGY

MB - 802 : Molecular Biology - II

(2008 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Use of scientific calculators and log table is allowed***
4) ***Assume suitable data if necessary.***
5) ***Draw neat labeled diagrams wherever necessary.***

Q1) Comment on *any two* of the following: **[16]**

a) Explain how different sigma factors control the transcription.

b) Discuss the role of chaperons in protein folding.

c) Justify: importance of RNA editing.

Q2) Explain *any two* of the following: **[16]**

a) Explain in brief t-RNA processing.

b) Explain selection and screening of recombinants with example.

c) Explain Wobble hypothesis in detail.

Q3) Explain *any two* of the following: **[16]**

a) Role of different enzymes used in recombinant DNA technology.

b) Genome mapping and sequencing by any one method.

c) RNA splicing by splisiosome.

Q4) Write short notes on *any four* of the following: **[16]**

a) DNA microarry and their use in genomics.

b) DNA footprinting.

c) RT-PCR.

d) Anchor sequences.

e) Cytosolic protein degradation.

P.T.O.

Q5) a) A gene for which you have a cloned, labeled cDNA probe occurs once in an organism's genome. The gene contains one *EcoRI* cleavage site near its centre and has no intervening sequences. If you probe a Southern transfer of a complete *EcoRI* digest of the organisms DNA with your labeled cloned sequence, the number of radioactive bands you are most likely to find will be:

i) 0
ii) 1
iii) 2
iv) 3
v) 4 **[4]**

b) Before the genetic code deciphered, one of the hypothesis suggested that it was a fully overlapping triplet code. Several variations of such a code were proposed. All contained following general proportions:

i) The coding triplets are composed from four nucleuotides.
ii) Coding is fully overlapping, each triplet shearing two nucleotides with the succeeding triplet in sequence. Thus the sequence GCACA codes for three amino acids: GCA for the first, CAC for the second and ACA for the third.
iii) An amino acid may be represented by more than one triplet.

Such overlapping codes place restrictions on amino acid sequences. For example, the amino acid coded for GCA can be followed only by an amino acid that has a cdon beginning with CA. Calculate maximum number of different dipeptide sequences that can occur with hypothetical, overlapping triplet code and for the code as we know it. **[12]**

☛ ☛ ☛

Total No. of Questions : 5] **[Total No. of Pages : 2**

P503

[3825] - 403
M.Sc.
MICROBIOLOGY
MB - 803 : Microbial Technology
(2008 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) With the help of a diagram, describe the construction of a bioreactor used for immobilized cells. State the situations in which such a bioreactor is used, and explain the advantages of the process. **[16]**

OR

Describe the production of chitinase. Delineate the critical operating parameters for chitinase production.

Q2) Attempt ***any two*** of the following: **[16]**

a) With help of a suitable example, explain the fed-batch mode of operation of fermentation process. How is a fed-batch mode more convenient as compared to batch process?

b) What is "OTR" in context with a fermentation process? Explain with a suitable example.

c) Explain the principle, construction and operation of a pH sensor.

Q3) Attempt ***any two*** of the following: **[16]**

a) What is N_a? Explain its significance in determining aeration rate.

b) Explain biocontrol with the help of a suitable example.

c) Explain the construction of and flow patterns created by a Rushton turbine.

P.T.O.

Q4) Write short notes on ***any four*** of the following: **[16]**

a) N_p

b) Limitations of continuous culture.

c) 'OUR'

d) IPR

e) Standard Operating Procedures.

Q5) A fermentation to produce pullulan was carried out at shake flask level. The data obtained is given in the figures given below. **[16]**

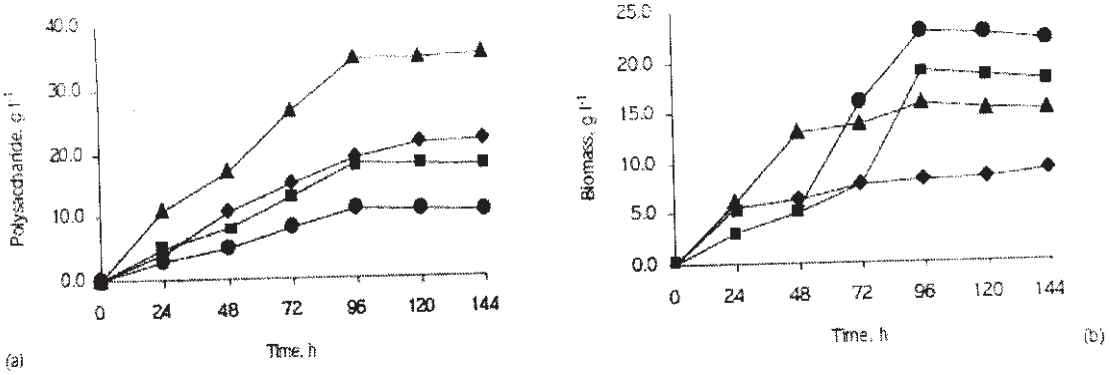


Figure 1. Polysaccharide (a) and biomass (b) production of *A. pullulans* in synthetic medium (◆), sulfuric acid + activated carbon treated molasses (▲), sulfuric acid treated molasses (■), potassium ferrocyanide treated molasses (●) in shake flasks at 28 °C, 200 rpm (pH 7.5, initial sugar concentration = 50 g l^{-1}).

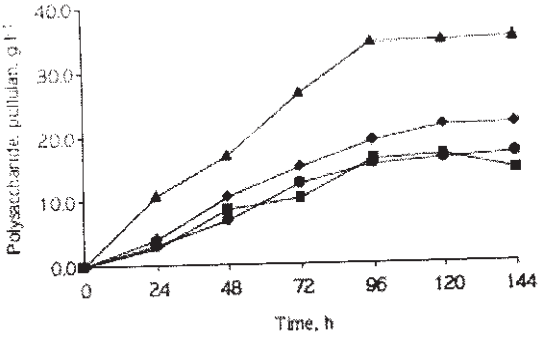


Figure 2. Polysaccharide and pullulan production by *A. pullulans* in molasses medium treated with sulfuric acid + activated carbon and synthetic medium in shake flasks at 28 °C, 200 rpm (polysaccharide in synthetic medium, ◆; pullulan in synthetic medium, ■; polysaccharide in molasses medium, ▲; pullulan in molasses medium, ●)

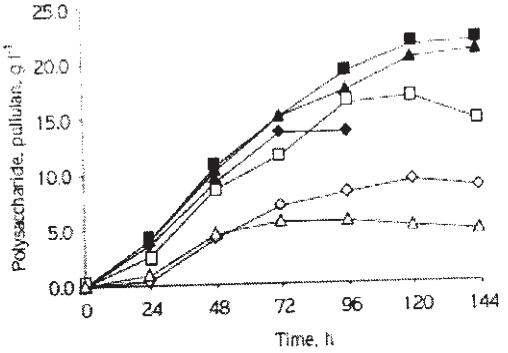


Figure 3. Polysaccharide and pullulan production with *A. pullulans* from synthetic medium containing different initial sugar concentrations in shake flasks at 28 °C, 200 rpm (polysaccharide from 30 g $^{-1}$ initial sugar, ◆; polysaccharide from 50 g $^{-1}$ initial sugar, ■; polysaccharide from 70 g $^{-1}$ initial sugar, ▲; pullulan from 30 g $^{-1}$ initial sugar, ◇; pullulan from 50 g $^{-1}$ initial sugar, □; pullulan from 70 g $^{-1}$ initial sugar, △).

Interpret the data obtained and answer the following questions, giving reasons:

a) Which medium is better for pullulan production?

b) Why does the molasses containing medium have to be treated with activated carbon?

c) From the given data, what are the optimum operating conditions for maximum yield?

☛ ☛ ☛

Total No. of Questions : 5] **[Total No. of Pages : 1**

P504

[3825] - 31
M.Sc.
MICROBIOLOGY
MB - 701 : Immunology
(2005 Pattern) (Old Course)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) Attempt *any two* of the following: **[16]**

a) Write the general properties and functions of TNF and IFN?

b) Explain in detail, the mechanism of signal transduction by the TCR/CD3 complex.

c) Describe the structure of Class I and Class II MHC molecules.

Q2) Describe in detail *any two* of the following: **[16]**

a) Mechanism of tolerance induction.

b) Evolution of immune system in Vertebrates.

c) Properties of cancer cells.

Q3) Explain *any two* of the following: **[16]**

a) Immunodiagnosis of tumors.

b) Kinetics of antigen antibody reactions.

c) Immune response to parasitic infections.

Q4) Write short notes on *any four* of the following: **[16]**

a) Network theory.

b) Rheumatoid arthritis.

c) Immunoregulatory role of cytokines.

d) Hemolytic plaque assay.

e) FACS.

Q5) How will you test the hypothesis that a given disease is associated with a certain MHC gene? **[16]**

☛ ☛ ☛

Total No. of Questions : 5] **[Total No. of Pages : 2**

P505

[3825] - 32

M.Sc.

MICROBIOLOGY

MB - 702 : Molecular Biology - I

(2005 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***Use of the logarithmic tables, and electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) Attempt *any two* of the following: **[16]**

a) Explain how the higher order structure of chromatin is formed.

b) Explain the different models for circular DNA replication.

c) Describe how the mismatch repair of a heteroduplex leads to gene conversion.

Q2) Attempt *any two* of the following: **[16]**

a) Explain how error proof DNA repair mechanism works.

b) Describe organization of Tn 10 transposons.

c) Explain how acetylation of histone tails helps in DNA accessibility.

Q3) Attempt *any two* of the following: **[16]**

a) Explain how DNA replication is connected to cell cycle in *E. coli*?

b) State and explain the characteristics of genetic code?

c) Describe how the Ras genes are finely balanced at the edge of oncogenes.

Q4) Write *short notes* on *any four* of the following: **[16]**

a) Sanger's di-deoxynucleotide method.

b) Holliday Model of recombination.

c) Base excision repair.

d) Zinc motifs.

e) RB proteins.

P.T.O.

Q5) a) If an *E. coli* auxotroph A could grow only on a medium containing thymine, and an auxotroph B could grow only on a medium containing leucine, how would you test whether DNA from A could transform B? **[8]**

b) In a mutant strain X of *E.coli*, a leucine tRNA that recognizes the codon 5'-CUG-3' in normal cells has been altered so that it now recognizes the codon 5'GUG-3'. A missense mutation, which affects aminoacid 10 of a particular protein, is suppressed in mutant X cells. **[8]**

i) What are the anticodons of two Leu tRNAs, and what mutational events have occurred in mutant X cells?

ii) What amino acid would normally be present at position 10 of the protein (Without the missense mutation)?

iii) What amino acid would be put in at position 10 if the missense mutation is not suppressed (that is, in normal cells)?

iv) What amino acid is inserted at position 10 if the missense mutation is suppressed (that is, in mutant cells)?

Total No. of Questions : 5] **[Total No. of Pages : 2**

P506

[3825] - 33

M.Sc.

MICROBIOLOGY

MB - 703 : Biophysics, Instrumentation and Bioinformatics

(2005 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***All questions carry equal marks.***
5) ***Use of logarithmic tables, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Attempt ***any two*** of the following: **[16]**

a) Explain the principle of Pulse-chase Experiment. Give the applications of tracer elements in biology.

b) Explain the working and instrumentation involved in FTIR spectroscopy. What are the advantages of FTIR over IR spectroscopy?

c) Describe the principle of gel filtration chromatography. Does the shape of proteins affect the elution and why?

Q2) Attempt ***any two*** of the following: **[16]**

a) Give principle of X-ray diffraction. Explain the problems involved in phase determination and their solutions.

b) What is the basis of NMR spectroscopy. Explain the terms chemical shift and spin-spin coupling.

c) Give the basic instrumentation of mass spectrometry. With the help of example explain how Ion Fragmentation is done in mass spectrometry.

Q3) Attempt ***any two*** of the following: **[16]**

a) Explain the concept of Ramachandran plot. How do various angles in polypeptide chain decide the structure of proteins?

b) Explain Smith-Walterman dynamic programming algorithm. State the differences between PAM and BLOSUM matrices.

c) What are hidden Marcov models? How are they used for gene finding?

P.T.O.

Q4) Write short notes on ***any four*** of the following: **[16]**

a) Circular dichroism.

b) FASTA.

c) Differential centrifugation.

d) Neural networks.

e) Isoelectric focussing.

Q5) Solve the following:

a) A solution of L-leucine (3.0 g/50 ml of 6 N HC1) had an observed rotation of + 1.81° in a 20 cm polarimeter tube. Calculate

i) The specific rotation [α] and

ii) The molar rotation $[\alpha]_M$ of L-leucine in 6 N HC1. **[8]**

b) The relative electrophoretic mobilities of a 30-kd protein and a 92-kd protein used as standards on an SDS-polyacrylamide gel are 0.80 and 0.41, respectively. What is the apparent mass of a protein having a mobility of 0.62 on this gel? **[8]**

Total No. of Questions : 5] **[Total No. of Pages : 2**

P507

[3825] - 41

M.Sc.

MICROBIOLOGY

MB - 801 : Applied Microbial Biotechnology

(2005 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Explain the characteristics of fermentation broth that affect its rheology. Explain how broth rheology can affect a fermentation process. **[16]**

OR

Explain the objectives of immobilization of microbial cells. Describe the application of immobilized cells in any one industrial application/fermentation.

Q2) Attempt *any two* of the following: **[16]**

a) What are biocontrol agents? Explain the use of any one biocontrol agent, with help of a suitable example.

b) Illustrate the differences in flow patterns by different types of impellers. Explain this with the help of suitable diagrams.

c) Describe the role of siderophores in metal sequestration in soil environments.

Q3) Attempt *any two* of the following: **[16]**

a) Explain how *Trichoderma* species are used for promoting plant growth.

b) State the difference between in-line and on-line biosensors. Describe the construction of in-line sensor used for monitoring a fermentation process parameter.

c) Explain the economical significance of microbial leaching of copper. Draw a diagram to illustrate microbial leaching of copper.

P.T.O.

Q4) Write *short notes* on *any four* of the following: **[16]**

a) Phytoalexins.

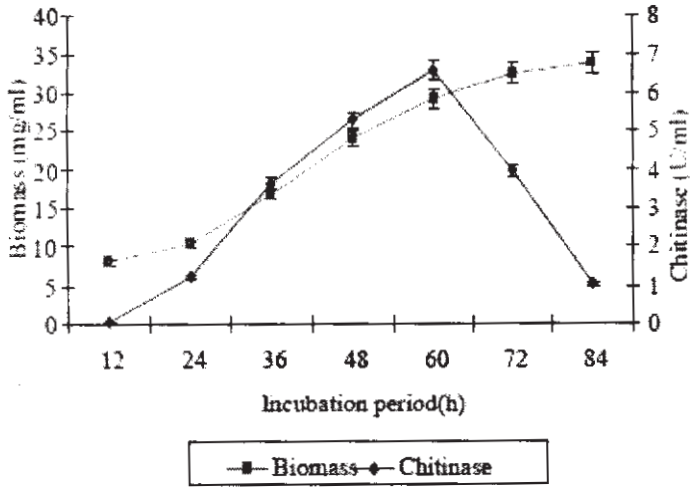
b) Manganese oxidation by bacteria.

c) Newtonian fluids.

d) B t as a biocontrol agent.

e) *Trichoderma viridae* as a antifungal agent.

Q5) **[16]**



The above graph shows the production of chitinase enzyme by *Streptomyces* sp. Interprete the results and answer the following questions:

a) Is chitinase a primary or a secondary metabolite? Explain how you arrived at the answer.

b) What are the possible reasons for decrease in chitinase production after 60 hours?

Total No. of Questions : 5] **[Total No. of Pages : 2**

P508

[3825] - 42

M.Sc.

MICROBIOLOGY

MB - 802 : Pharmaceutical Microbiology

(2005 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicates full marks.***
3) ***Draw diagrams wherever necessary.***
4) ***All questions carry equal marks.***
5) ***Use of the logarithmic electronic pocket calculator is allowed.***
6) ***Assume suitable data if necessary.***

Q1) Answer ***any one*** of the following. **[16]**

a) Explain in detail the *in vitro* screening and various tests adapted to evaluate the novel antibiotics.

b) Illustrate in detail the mechanism of action of nucleic acid inhibitors and the evidential experiments supporting the target of action.

Q2) Answer ***any two*** of the following:- **[16]**

a) How do drugs interfere in the biosynthesis of the cell wall? Give the probable reasons for the resistance developed in the cells.

b) Explain the action of cholera toxin and endotoxins.

c) How will you determine the drug sensitivity of newer compounds developed against *Mycobacterium leprae*. Explain in brief.

Q3) Comment on ***any two*** of the following: **[16]**

a) Gradient plate technique.

b) Nitrofurans.

c) Anti-protozoal agents.

P.T.O.

Q4) Write short notes on ***(any four)*** **[16]**

a) Mechanism of bacterial resistance to host cellular defenses.

b) Targets for the action of drug.

c) Physical characterization of drug.

d) LAL test.

e) Bio-availability of drugs.

Q5) In the routine practical done in your laboratory you have observed that a fresh soil isolate of a fungus showed large inhibition zone around an air contaminant of *Bacillus*. After observing this noteworthy result, what would be your steps to study this antifungal bacterium and the bioactive compound? **[16]**

Total No. of Questions : 5] **[Total No. of Pages : 2**

P509

[3825] - 43

M.Sc.

MICROBIOLOGY

MB - 803 : Molecular Biology - II

(2005 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***

Q1) Answer *any two* of the following. **[16]**

a) How does RNA polymerase find promoter sequence in *E.coli*?

b) State the role of active centers in ribosomes.

c) Justify- Type II RE are unique in their action.

Q2) Answer *any two* of the following: **[16]**

a) Explain the key features of protein engineering.

b) How would you use RFLP in genetic mapping?

c) Explain why pBR 322 is better vector than other plasmids.

Q3) Schematically/diagrammatically represent *any two* of the following: **[16]**

a) Attenuation control in *trp* operon.

b) Northern blotting hybridization technique.

c) How will you prepare cDNA copy of 'factor VIII' gene from mRNA.

Q4) Write short note on *any four* of the following: **[16]**

a) Initiation of transcription in prokaryots.

b) Detection of amplified gene in RT-PCR.

c) Promoters on Lambda DNA.

d) Basis of antibody diversity.

e) Expression vectors.

P.T.O.

Q5) a) Living cells produce different types of RNA during growth. Complete the following table by entering the appropriate type of RNA in front of the question. **[8]**

Sr. No.	Question	Type of RNA
1	RNA with pseudouridine in it.	
2	RNA synthesized by RNA Pol I	
3	RNA with CCA at 3' end	
4	RNA that serves as template for genetic function	
5	4 types in eukaryotes and only 3 types in *E. Coli*	
6	Capped at 5' end	
7	Having sequence complementary to Shine-Dalgarno sequence	
8	Attached to IF2 during transcription.	

b) Actively transcribed DNA was isolated from a eukaryotic cell, treated with DNAse I. and electrophoresed. DNA fragments created a ladder made up of fragments of 50 bp , 250 bp, 450 bp and 650 bp.and so on.

Explain how a non specific endonuclease could produce DNA fragments of this specific defined lengths? **[8]**