Question Paper

Exam Date & Time: 20-Nov-2023 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIFTH SEMESTER B. Sc. BIOTECHNOLOGY DEGREE EXAMINATION - NOVEMBER 2023
SUBJECT: BBT-301 - MICROBIAL BIOTECHNOLOGY
(OBE-2020 REGULATION - REPEATERS)

Marks: 70 **Duration: 180 mins.**

Answer all the questions.

Illustrate where necessary.

1A)	What do you mean by RIA and ELISA?	(1)
1B)	What are dimorphic fungi?	(1)
1C)	Name any two organisms causing food poisoning.	(1)
1D)	What is ADC and DAC?	(1)
1E)	What are agitators?	(1)
1F)	What do you mean by cryopreservation?	(1)
1G)	Name any two endospore forming bacteria involved in food spoilage.	(1)
1H)	List any two benefits of probiotics.	(1)
1I)	What is DEFT?	(1)
1J)	What is resuscitation medium?	(1)
2A)	Write a note on bacterial growth curve.	(5)
2B)	Briefly explain methylene blue reduction test.	(5)
2C)	Write a brief note on upstream fermentation.	(5)
2D)	What is strain preservation? What are the different methods involved in strain preservation?	(5)
2E)	Briefly discuss the various intrinsic factors that influence bacterial growth in food.	(5)
2F)	Write a note on role of biosensors in food safety.	(5)
3A)	Discuss the role of inducers, inhibitors and antifoaming agents used in the nutrient media.	(10)
3B)	With illustration give a detailed note on design and components of fermenter.	(10)
3C)	Explain how high temperature treatment can be used in food preservation.	(10)

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MANIPAL ACADEMY OF HIGHER EDUCATION

FIFTH SEMESTER B. Sc. BIOTECHNOLOGY DEGREE EXAMINATION - NOVEMBER 2023
SUBJECT: BBT-301 - MICROBIAL BIOTECHNOLOGY
(OBE-2021 REVISED REGULATION - REGULARS)

Marks: 70 **Duration: 180 mins.**

Answer all the questions.

Illustrate where necessary.

1A)	What is reverse passive latex agglutination assay (RPLA)?	(1)
1B)	What do you mean by CFU/mL? Write the formula to calculate the CFU/mL.	(1)
1C)	Name any two fungi responsible for food poisoning.	(1)
1D)	What are yeasts and molds?	(1)
1E)	What is the difference between probiotics and antibiotics?	(1)
1F)	What is E-tongue?	(1)
1G)	What are secondary metabolites?	(1)
1H)	What is a DO probe?	(1)
1I)	What is yield coefficient?	(1)
1J)	What is FlavrSavr Tomato?	(1)
2A)	Write a note on carbon sources and nitrogen sources in the media used for the fermentation process.	(5)
2B)	What is generation time? Write a note on bacterial growth curve.	(5)
2C)	What is HACCP? How does it help in food safety?	(5)
2D)	Explain the terms: (a) Pascalization and (b) Pasteurization.	(5)
2E)	Write a brief note on various agencies involved in maintaining food quality standards.	(5)
2F)	Illustrate and explain the basic design of a fermenter.	(5)
3A)	Discuss the industrial production of citric acid and its application.	(10)
3B)	Discuss the various factors that influence microbial growth in food.	(10)
3C)	Discuss in detail the role of microorganisms in the field of food microbiology.	(10)

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Question Paper

Exam Date & Time: 17-Nov-2023 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIFTH SEMESTER B. Sc. BIOTECHNOLOGY DEGREE EXAMINATION - NOVEMBER 2023
SUBJECT: BBT-303 - BIOSTATISTICS
(OBE-2021 REVISED REGULATION - REGULARS)

Marks: 70 **Duration: 180 mins.**

Answer all the questions.

1A)	Which multiple comparison test (Post hoc test) is used for one-way ANOVA?	(1)
1B)	What is the standard error associated with difference in proportion?	(1)
1C)	Define correlation.	(1)
1D)	What are the mean and variance of standard normal distribution?	(1)
1E)	Range of probability is _____.	(1)
1F)	Define Type-II error.	(1)
1G)	What is a statistic?	(1)
1H)	What is the nonparametric analogues test for the Paired t-test?	(1)
1I)	Define Null Hypothesis.	(1)
1J)	Mention any two measures of dispersion.	(1)

2A. Suppose that a market research firm is hired to estimate the percentage of adults living in a large city who have cell phones. Five hundred randomly selected adult residents in this city are surveyed to determine whether they have cell phones. Of the 500 people sampled, 421 responded yes - they own cell phones. Using a 95% confidence level,

i)	Compute the Margin of Error for the true population proportion.	(2)
ii)	Also, the Confidence interval for the true population proportion.	(3)

2B. Allogamy (cross-fertilization) of a red and a white flower produces red flowers 25% of the time. Now we cross-fertilize five pairs of red and white flowers and produce five off-springs. Find the probability that there will be:

i)	Two or more red flowered plants.	(3)
ii)	Compute the mean and standard deviation of the distribution.	(2)

2C i)	Define coefficient of variation.	(2)
2C ii)	Mean and Standard deviation of Systolic Blood Pressure of a group of adults is 130mmHg and 4mmHg respectively and that of weight is 60kg and 3kg respectively. Which of these characteristics	(3)

are more consistent?

2D. In a clinical study, researchers are investigating the recovery time of patients after a specific surgical procedure. The probability distribution for the recovery time (in days) is as follows:
Probability of recovery in 5 days: 0.20
Probability of recovery in 7 days: 0.40
Probability of recovery in 10 days: 0.25
Probability of recovery in 14 days: 0.15

i)	Find the expected recovery time for a patient.	(2)
ii)	Find the variance of the recovery time.	(2)
iii)	Find the standard deviation of the recovery time.	(1)

2E)	Which are the two types of sampling methods. Under each type list three sampling techniques Respectively.	(5)
2F)	A pharmaceutical company is conducting a clinical trial to estimate the mean reduction in systolic blood pressure (SBP) in patients taking a new hypertension medication. They want to estimate the mean reduction with a 95% confidence interval and a precision (margin of error) of no more than 2 mm Hg. They expect the mean reduction to be around 10 mm Hg, and they have historical data with a standard deviation of 8 mm Hg. What sample size is needed for the study?	(5)

3A. A study reported on a retrospective review of initial sonograms performed on 65 twin gestations to evaluate the ability of sonography to distinguish monochorionic from dichorionic gestations based on the thickness of the membrane separating the fetuses. The results are shown in the contingency table below.

	Condition		
Ultrasound Exam Result	Dichorionicity (D)	Monochorionicity (D′)	Total
Thick membrane (+)	39	8	47
Thin membrane (−)	3	15	18
Total	42	23	65

i)	Calculate the Prevalence of the disease from the data given above.	(2)
ii)	Define Sensitivity. Calculate the same from above given data. (2+2 = 4 marks)	(4)
iii)	Define Specificity. Calculate the same from the given data. (2+2 = 4 marks)	(4)

3B. In a clinical study, researchers are investigating the factors that affect the blood pressure (BP) of patients. They developed a multiple linear regression model with the following equation:
BloodPressure (BP)=80+(1.5∗Age) −(3.2∗Weight) +(2.8∗CholesterolLevel)
Adjusted R-squared = 0.75

i)	Which is the Response variable here?	(1)
ii)	What are the Explanatory Variables?	(1)

iii)	What is the interpretation of the above multiple linear regression equation?	(3)
iv)	What does Adjusted R2 =0.75 indicate?	(1)
v)	What are the assumptions of simple linear regression?	(4)

3C. As part of a classic experiment on mutations, 10 aliquots of identical size were taken from the same culture of the bacterium E. coli. For each aliquot, the number of bacteria resistant to a certain virus was determined. The results were as follows: 14, 26, 16, 20, 13, 14, 15, 13, 21 and 18.

i)	Compute the Quartiles.	(6)
ii)	Plot a box plot.	(4)

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Question Paper

Exam Date & Time: 24-Nov-2023 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIFTH SEMESTER B. Sc. BIOTECHNOLOGY DEGREE EXAMINATION - NOVEMBER 2023
SUBJECT: BBT-305 - ADVANCED GENOMICS
(OBE-2021 REVISED REGULATION - REGULARS)

Marks: 70 **Duration: 180 mins.**

Answer all the questions.

Illustrate where necessary.

1A)	Write difference between euchromatin and heterochromatin.	(1)
1B)	What is XIST and its function?	(1)
1C)	What is the function of histone acetyl transferase?	(1)
1D)	Define missense SNP.	(1)
1E)	Write the principle of Sanger Sequencing.	(1)
1F)	What is genophore?	(1)
1G)	Give an example for tandem repeats in the human genome.	(1)
1H)	Give an example for a genetic mapping marker.	(1)
1I)	What are LINEs?	(1)
1J)	What is a repressor?	(1)
2A)	Write a brief account of RNA World hypothesis.	(5)
2B)	Describe the objectives, goals and achievements of the HGP.	(5)
2C)	Write a brief account of the abnormal types of chromosomes.	(5)
2D)	Write a short essay on transposable elements in the human genome.	(5)
2E)	Describe the role of genomics in precision medicine.	(5)
2F)	Explain the application of DNA microarray in genome analysis.	(5)
3A)	Describe the role of DNA methylation in genome instability and altered regulation of gene expression during cancer progression.	(10)
3B)	Describe the role of histone modification in regulation of gene expression and function.	(10)
3C)	Describe the organization and functioning of an operon using *lac* operon as an example.	(10)

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Question Paper

Exam Date & Time: 22-Nov-2023 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIFTH SEMESTER B. Sc. BIOTECHNOLOGY DEGREE EXAMINATION - NOVEMBER 2023
SUBJECT: BBT-307 - NANOBIOTECHNOLOGY
(OBE-2021 REVISED REGULATION - REGULARS)

Marks: 70 **Duration: 180 mins.**

Answer all the questions.

Illustrate where necessary.

1A)	What are quantum dots? Give two examples.	(1)
1B)	List any two advantages and disadvantages of solid lipid nanoparticles as nano delivery system.	(1)
1C)	Who made the historical statement, "There is plenty of rooms at the bottom"?	(1)
1D)	List the external triggers used in physical targeting.	(1)
1E)	Name different tests used to determine cell viability.	(1)
1F)	Differentiate active and passive targeting.	(1)
1G)	What are nano-pollutants? Give two examples.	(1)
1H)	Write full form of SPM.	(1)
1I)	Name two nanoparticles with antimicrobial activity.	(1)
1J)	What is laser ablation method?	(1)
2A)	Give a brief note on application of nanomaterials in tissue engineering.	(5)
2B)	Elaborate sandwich targeting used in drug delivery systems.	(5)
2C)	Explain in brief on the role of nanomaterials in agriculture.	(5)
2D)	Write the advantage of electron microscope over light microscope. With a neat diagram, explain the working principle, sample preparation and applications of scanning electron microscope.	(5)
2E)	Explain in brief properties of nanomaterials.	(5)
2F)	Explain the principle of lithography. Discuss the advantages and disadvantages of photolithography and electron beam lithography.	(5)
3A)	Discuss the applications of following nanoparticles in drug delivery: (i) Liposomes and (ii) Carbon nanotubes.	(10)
3B)	Explain in detail the application of nanomaterial in diagnostics.	(10)
3C)	Give a detailed account on the mechanism of cellular toxicity of nanomaterial.	(10)

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Question Paper

Exam Date & Time: 15-Nov-2023 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIFTH SEMESTER B.Sc. BIOTECHNOLOGY DEGREE EXAMINATION - NOVEMBER 2023
SUBJECT: BBT-309 RESEARCH METHODOLOGY
(OBE-2021 REVISED REGULATION - REGULARS)

Marks: 70 **Duration: 180 mins.**

Answer all the questions.

Illustrate where necessary.

1A)	Define the IMRAD system.	(1)
1B)	Name two essential ingredients of a well-written scientific paper.	(1)
1C)	Define science editing tools.	(1)
1D)	Name any two national research funding agencies.	(1)
1E)	What is the importance of sampling in research?	(1)
1F)	Define exploratory research.	(1)
1G)	Define GLP.	(1)
1H)	Define Copyright.	(1)
1I)	Define Hypothesis.	(1)
1J)	Define Biohazard.	(1)
2A)	Write a brief account on types of hypothesis and errors in hypothesis testing.	(5)
2B)	Explain the ethical aspects in research involving human subjects.	(5)
2C)	Write a brief note on the importance of laboratory notebook.	(5)
2D)	Write a short essay on the types of scientific research.	(5)
2E)	Give a brief account on types of sampling.	(5)
2F)	Explain in detail, the processing, analysis, and interpretation of the research data.	(5)
3A)	Discuss the types of literature review and steps of searching the literature.	(10)
3B)	Discuss the essential elements of the oral presentation of research results.	(10)
3C)	Explain the various steps in research methodology.	(10)

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