Question Paper

Exam Date & Time: 29-Dec-2023 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

THIRD SEMESTER M.Sc. (GENOME ENGINEERING / TISSUE ENGINEERING) DEGREE EXAMINATION - DEC 2023 / JAN 2024
SUBJECT: MGE 601 / MTE 601 IMMUNE ENGINEERING
(OBE-2021 REVISED REGULATION - REGULARS)

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

Answer all the questions.

Answer all with appropriate illustrations. (wherever necessary)

Essays:

1)	Define immune system, types and its components. Explain development and maturation of lymphocytes.	(14)
2)	Describe the application of immune cell engineering for cancer therapy.	(14)

Short Essays:

3A)	Principle and application of immune checkpoint inhibitors in cancer therapy.	(7)
3B)	Explain central and peripheral tolerance and discuss its role in intrinsic quality control mechanism.	(7)
4A)	Explain killed/inactivated vaccines, methods used for attenuation and how do inactivated vaccines work.	(7)
4B)	T cell anergy.	(7)

5. **Short Notes:**

5A)	Tumor associated macrophages.	(3.5)
5B)	Autoimmune reactions.	(3.5)
5C)	Magic Bullets.	(3.5)
5D)	Adaptive immunity.	(3.5)

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Question Paper

Exam Date & Time: 27-Dec-2023 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

THIRD SEMESTER M.Sc. (MEDICAL BIOTECHNOLOGY / MOLECULAR BIOLOGY AND HUMAN GENETICS / GENOME ENGINEERING / TISSUE ENGINEERING) DEGREE EXAMINATION - DEC 2023 / JAN 2024
SUBJECT: MBT601 / MBH601 / MGE 603 / MTE 603 BIOSTATISTICS AND BIOINFORMATICS
(OBE-2021 REVISED REGULATION - REGULARS)

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

SECTION A - BIOSTATISTICS (35 MARKS)

Answer all the questions.

1A)	Identify the type of variable (Nominal/Ordinal/Discrete/Continuous) i) Gender ii) Lifespan of fruitflies (in completed days) iii) Residual sugar content (g/l) in wine	(3)
1B)	Define the following terms used in statistical inference: i) Type II error ii) Sampling distribution	(2)
1C)	Gene mutations have been found in patients with muscular dystrophy. In a study, it was found that there were defects in the gene coding of sarcoglycan proteins in 23 of 184 patients with limb-girdle muscular dystrophy. Use these data to construct a 90% confidence interval for the corresponding population proportion.	(4)
1D)	Distinguish between case-control study and a cohort study.	(5)
2A)	A certain form of cancer is known to be found in women over 60 years of age with probability 0.08. A blood test exists for the detection of the disease but the test is not infallible. In fact, it is known that 2% of the time the test gives a false negative (i.e., the test incorrectly gives a negative result) and 10% of the time the test, gives a false positive (i.e., incorrectly gives a positive result). If a woman over 60 years is known to have taken the test and found negative for cancer, what is the probability that she has the disease?	(3)
2B)	A certain drug treatment cures 80% of cases of hookworm in children. Suppose that 12 children suffering from hookworm are to be treated, and that the children can be regarded as a random sample from the population. Find the probability that: i) All but one will be cured ii) At least one will be cured	(4)
3)	In a study of the lizard Sceloporus occidentalis, biologists measured the distance (m) run in two minutes for each of 14 animals. The results (listed in increasing order) were as follows: 18.4 22.2 24.5 26.4 27.5 28.7 30.6 32.9 32.9 34.0 34.8 37.5 42.1 45.5 Compute quartile deviation.	(7)
4)	Distinguish between linear and logistic regression.	(3.5)
5)	A study was planned to find whether there is any difference in the average RBC Cholinesterase values (measured in micro mol/min/ml) between alcoholic and non-alcoholic adult males. What should be the minimum sample size required in each group to detect a clinically significant difference of 3 micro mol/min/ml at 90% power and 5% level of significance? Assume the pooled standard deviation of RBC Cholinesterase values is 5 micro mol/min/ml. ($Z1-\alpha/2 = 1.96$, $Z1-\beta = 1.28$)	(3.5)

PART B - BIOINFORMATICS (35 MARKS)

Answer all the questions.

Illustrate where necessary.

6A)	Describe the workflow employed for the analysis of microarray data.	(3.5)
6B)	Write a note on docking studies.	(3.5)
7A)	How does PubMed process its queries?	(7)
7B)	What are different types of BLAST? Add a note on the score and E-Value used in interpreting BLAST results.	(7)
8)	What are the steps to be followed for building a phylogenetic tree? Explain in detail the distance based method of tree building.	(14)

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