BRAINWARE UNIVERSITY

Term End Examination 2022
Programme – B.Sc.(BT)-Hons-2018/B.Sc.(BT)-Hons-2019/B.Sc.(BT)-Hons-2020
Course Name – Bio-mathematics/Bio-Mathematics
Course Code - BBT504C2/BBTD502C
(Semester V)

Full Marks : 70   **Time : 3:0 Hours**
[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)   1 x 15=15

1.   *Choose the correct alternative from the following :*

(i)   Identify the species that hunt in packs, such as the African wild dogs, would not be able to locate and capture prey as efficiently in smaller groups. So their population will be reduced due to ....

a) Exceeding carrying capacity   b) Allee effect
c) Gompertz growth   d) All of above

(ii) Recognize this growth model statement, growth is slowest at the start and end of a given time period, but steeply rises in the middle. Name the model.

a) Gompertz growth model   b) Logistic growth model
c) Malthusian growth model   d) All of above

(iii) Label the common ratio of the series 64, 48, 36, 27, ...

a) one forth   b) three forth
c) half   d) two third

(iv) Identify the following has been criticized as a pessimistic theory?

a) Lotka-Volaterra Model   b) Gompertz theory
c) Malthusian Theory   d) Evolution theory

(v) Identify the blankFor a population, the intrinsic rate of increase is the ....per capita growth rate.

a) Minimum   b) Maximum
c) Average   d) None of them

(vi) Define carrying capacity ?

a) total number of individuals   b) maximum number of individulas a poulation can intake

c) minimum number of individulas a poulation can intake   d) None of them

(vii) Compare disease transmission model, the total population In S-I-R-S ¦.

a) Decreases with time   b) Increases with time
c) Stays constant with time   d) Changes with time

(viii) Illustrate In the logistic growth model P = 1.3P(1 ′ P/10), what values of P will cause P to

be negative?

a) P=10   b) P<10

c) P %10   d) P>10

(ix) Find out the next number in the sequence: 39, 47, 55, 63, ...

a) 70   b) 71

c) 72   d) 73

(x) Explain If $dH/dt = rH - pHP$ is the prey equation in Lotka-Volterra model (H= prey population, P = predator population), what does 'r' mean?

a) The proportion of predator encounters   b) Death rate of prey

c) Carrying capacity of the habitat   d) Biotic potential of prey

(xi) Trace that, In the Michaelis–Menten enzyme kinetics model, enzyme reactions are not influenced by ....

a) Product concentration   b) Substrate concentration

c) enzyme concentration   d) both product and enzyme concentration

(xii) Infer the derive process of the Michaelis-Menten equation, which one of the following is used?

a) Laws of mass action   b) Geometric progression

c) Arithmetic progression   d) none of them

(xiii) Discover that Epidemiologists are interested in learning about

a) the causes of diseases   b) the frequency and geographic distribution of diseases

c) the causal relationships between diseases   d) all of them

(xiv) predict the blank where "Diseases that are always present in a community, usually at a low, more or less constant frequency are classified as having an _____ pattern.

a) epidemic   b) endemic

c) pandemic   d) exodemic

(xv) Choose which of the following statements is true concerning epidemic diseases?

a) They are usually not very contagious.   b) At the end of an epidemic, a disease spreads at an increasing rate and then abruptly disappears.

c) They usually appear and disappear seasonally.   d) none of them

Group-B
(Short Answer Type Questions)   3 x 5=15

2. Define SIR Disease model with and example?   (3)
3. Describe at each time t, $s(t) + i(t) + r(t) = 1$ (3)
4. illustrate the Age Structure Model?   (3)
5. Illustrate the lake pollution model according to the compartmental diagram.   (3)

OR

Give an example of a epidemic disease and calculate the disease model with the classical equation of SIR model?   (3)

6. Classify the difference between Mass in flow and Mass out flow in Lake pollution Model   (3)

OR

Explain the logical explanation how lake got polluted via classical equation of compartment diagram?   (3)

Group-C
(Long Answer Type Questions)   5 x 8=40

7. Summarize the Spruce Budworm Model and Mention seven unique characteristics of its?   (5)
8. What are the Standard Deviation and Variances, Mention the equations and Introduce the parameters?   (5)
9. Analyze the Basic reproduction No with equation and state an event regarding this.   (5)

10. Compare the dynamic system modelling to an outbreak of Spruce Budworm population.   (5)
11. Conclude the prey predator theory and Justify R in Lotka Volterra Model?   (5)
12. Determine the probability of a flipping coin in 12th time and calculate the probability of getting odd number for a dice and state a definition of stochastic process and give an example.   (5)
13. Discuss Spruce Budworm Model with first order differential equation and state some differentiation with Prey predator model.   (5)

OR

Explain the Nicholson Baileys model and derive the first order derivative equation.   (5)
14. Define Probability and describe each types of probability with example?   (5)

OR

Define Decay model and mention its salient features with an equation.   (5)

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