

**Chittagong Veterinary and Animal Sciences University, Chittagong**

**Faculty of Fisheries**

B. Sc. Fisheries (Hons.) Year -03 Semester-01, Final Examination' 2017

Course No: CCF-301(T, Course Title: **Climate Change and Fisheries (Theory)**

Total Marks: 70, Time: 3 hours

*Answer any 5 (five) questions from each section. Figures in the right margin indicate full mark. Use separate answer script for each section.*

**Section-A**

- |    |    |                                                                                                                             |     |
|----|----|-----------------------------------------------------------------------------------------------------------------------------|-----|
| 1. | a) | What is 'global warming'?                                                                                                   | 1.0 |
|    | b) | What is your comprehensibility regarding 'feedback mechanism' in climate science.                                           | 2.0 |
|    | c) | Develop a model of ecosystem impacts of climate change.                                                                     | 4.0 |
| 2. | a) | What is vulnerability of climate change? Discuss the impacts of the vulnerabilities on the livelihood of local communities. | 5.0 |
|    | b) | Describe the impacts of extreme events on the emerging economy of Bangladesh.                                               | 2.0 |
| 3. | a) | Illustrate a graph to show the variation of ocean heat content over years.                                                  | 4.0 |
|    | b) | How ocean salinity, density and stratification are inter-linked with each other?                                            | 3.0 |
| 4. | a) | What is 'bio-climate envelope'? Mention its uses.                                                                           | 2.0 |
|    | b) | Describe the potential physiological impacts of climate change on fish.                                                     | 5.0 |
| 5. | a) | Develop a potential impacts pathway of climate change in fisheries sector.                                                  | 3.0 |
|    | b) | What policies can be encountered to develop new fisheries management approach in the context of climate change?             | 4.0 |
| 6. | a) | Climate change means ocean change – Explain.                                                                                | 4.0 |
|    | b) | Describe the interactive effects of climate change variables on trophic interactions?                                       | 3.0 |
| 7. | a) | What stands for MRV? Discuss its role in the light of 'Copenhagen Accord'.                                                  | 3.0 |
|    | b) | Briefly discuss the success of 'Montreal Protocol' in eliminating green-house gases.                                        | 4.0 |

**Section-B**

- |     |    |                                                                                                                                          |     |
|-----|----|------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 8.  | a) | What is green-house effect?                                                                                                              | 1.0 |
|     | b) | Elaborate your understandings regarding human involvement in modern climate change.                                                      | 6.0 |
| 9.  | a) | Define Aquaculture Zoning.                                                                                                               | 2.0 |
|     | b) | Describe the common problems due to the lack of spatial planning and management of aquaculture under the changing climate in Bangladesh. | 5.0 |
| 10. | a) | How does ocean become acidified day by day?                                                                                              | 2.0 |
|     | b) | Discuss the impacts of heat content and temperature on oceanic ecosystems.                                                               | 5.0 |
| 11. | a) | Develop a comparison on the impacts of primary and secondary productivity due to climate change.                                         | 4.0 |
|     | b) | Name the hypotheses that relate marine fish recruitment. Briefly describe any one of them.                                               | 3.0 |
| 12. | a) | Write down the importance of small-scale artisanal fisheries in Bangladesh.                                                              | 3.0 |
|     | b) | How do such fisheries become vulnerable due to the exposure of negative climate?                                                         | 4.0 |
| 13. | a) | Enumerate the climatic distribution of aquaculture products.                                                                             | 2.0 |
|     | b) | Prepare an energy vs value evaluation of shrimp in Bangladesh in the context of climate changing forces.                                 | 3.0 |
|     | c) | What can be potential significance of aquaculture commodities in human food basket?                                                      | 2.0 |
| 14. | a) | What stands for IPCC? Mention its aims.                                                                                                  | 2.0 |
|     | b) | How IPCC reports can be beneficial in meeting future climate changes?                                                                    | 5.0 |

**Chittagong Veterinary and Animal Sciences University, Chittagong**  
**Faculty of Fisheries**  
 B. Sc. Fisheries (Hons.) Year -03 Semester-01, Final Examination' 2017  
 Course No: 301 (T), Course Title: **Fish Processing (Theory)**  
 Total Marks: 70, Time: 3 hours

Answer any **5 (five)** questions from each section. Figures in the right margin indicate full mark. Use separate answer script for each section.

**Section-A**

1. a) Fish is one of the most perishable among foodstuffs –justify the statement and give your opinion how to solve the problem in processing aspects. 4
- b) Classify fish protein based on solubility. How do explain the term 'essential amino acid (EAA)'? List down the EAAs required in the diet for adult. Which EAA is rich in fish protein but less in vegetable? 3
2. a) Define fish processing. Explain its applications in sustainable fisheries resources of Bangladesh. 4
- b) Give a brief outline of shrimp supply channel. How will you solve the existing problems in fish marketing? 3
3. a) Explain different stages of rigor mortis. Write in brief importance of rigor in fish processing. 3
- b) Write down principles of refrigeration. Discuss in details refrigeration process with schematic diagram. 4
4. a) Suppose you have 1 (one) ton of Hilsha fish and you need to reduce the temperature at  $-40^{\circ}\text{C}$ . How will you do the assignment if your raw materials temperature is at  $28^{\circ}\text{C}$ ? Calculate the total energy related with this statement. 5
- b) Discuss 'thermal arrest time' with diagram. 2
5. a) Differentiate quick freezing and slow freezing. List down the factors affecting freezing time of fish. 3
- b) Write down different freezing methods employed in seafood processing industry. Which one you will choose for *Penaeus monodon* freezing? Discuss detailed operational process of shrimp freezing. 4
6. a) Explain the following terms i) TDT (thermal death time); ii) *F*-value ii) '12D' concept 3
- b) Define chilling and super chilling of fish. 2
- c) Write down the factors that regulate the amount of ice required to chill the fish. 2
7. Write short notes **any two** of the following 3.5 x 2= 7  
 a) Cryogenic freezing; b) Modified atmosphere packaging c) Design of cold storage; d) Fish sauce

**Section B**

8. a) Compare between hot smoking and cold smoking. Write down influences of wood smoke as preservative. 3
- b) Discuss how spoilage occurs in dried products and how to solve it. 4
9. a) Give a brief description on development of commercial canning. Canning is the best method of processing – justify the statement. 4
- b) Write down principles of canning. Draw a schematic diagram on fish canning. 3
10. a) Classify foods on the basis of acidity. Explain the method of 'Esty and Williams' considered for estimation of heat resistance. 3
- b) Write down influence of canning on quality of canned foods. List down common problems occur in canned fishery products. 4
11. a) Mention the objective of packaging. Write down its functions. Name the materials used in packaging. 3
- b) Categorize fermented fish products on salt content. Write down factors affecting processing and quality of fish sauce. 4
12. a) How does moisture remove from fish during sundrying? 2
- b) Enumerate the nature and extent of blow fly and beetle infestation in dry fish. 3
- c) Give 4 (four) important environment-friendly safe measures to control insect infestations in dry fish. 2
13. a) Distinguish between surimi and mince 2
- b) What kind of fishes are suitable for surimi production and why? 2
- c) Why the fish mince is washed and sugar is added to the mince during surimi manufacture? 3
14. Write short notes **any two** of the following 3.5 x 2= 7  
 a) Semi-IQF of white fish ; b) Tastiness of Hilsa; c) Air blast freezer; and d) Reddening of salted fish.

**Chittagong Veterinary and Animal Sciences University, Chittagong**  
**Faculty of Fisheries**

B. Sc. Fisheries (Hons.) Year -03 Semester-01, Final Examination' 2017  
Course No: 301 (T), Course Title: **Aquatic Pollution and Toxicology (Theory)**  
Total Marks: 70, Time: 3 hours

*Answer any 5 (five) questions from each section. Figures in the right margin indicate full mark. Use separate answer for each section.*

**Section-A**

1. a) What is the main difference between ballast water and bilge water? 1.0  
b) How ballast water and bilge water oil can produce serious concerns in marine environment? 2.0  
c) Discuss the impacts of shipping and shipyards induced marine pollution of Bangladesh. 4.0
2. a) List down the sources of sewage wastes in the waterways of Bangladesh? 2.0  
b) How the sewages from different sources enter waterways of Bangladesh? 2.0  
c) Briefly discuss the physical, chemical and biological properties of sewages. 3.0
3. a) Discuss the ecological effects of pesticides in marine environment? 3.0  
b) Discuss the principal mechanisms of bio-accumulation and bio-magnification of DDT in marine environment. 4.0
4. a) List down the names of different treatment methods that you can use for treatments of dissolved solid wastes and suspended solid wastes? 3.0  
b) Discuss any two methods that you can use for treatments of dissolved solid wastes containing water. 4.0
5. a) Specify the major environmental impacts of aquaculture in respect of inland and coastal aquatic pollution in Bangladesh. 3.0  
b) Formulate your own plan to mitigate aquaculture related pollution in inland water and coastal belt of Bangladesh. 4.0
6. a) What do you know about bio-indicator of water pollution? 2.0  
b) How can you understand the pollution status of a waterbody by the presence or absence of bio-indicator species? 2.0  
c) Metalloproteins as biomarkers of environmental contamination in fish. Clarify the statement. 3.0
7. Write short notes on the following topics (Any two): 3.5×2  
a) Microbial pollution      b) Redox-potential      c) Global warming      d) Carbon-buffer system

**Section-B**

8. Although some heavy metals are essential to normal growth and development of organisms, but some are highly toxic to organism even supplied at very low concentration. Some of the heavy metals showed a tendency of bio-accumulation and bio-magnification along higher trophic levels of the food chain. Based on the above statements, answer the following questions:
  - a) List down the toxicological properties of heavy metals. 1.0
  - b) Describe bioaccumulation and bio-magnification process of heavy metals with specific reference to Hg in marine food chain. 3.0
  - c) Formulate your bioremediation plan to control heavy metal pollution in marine environment 3.0
9. Anoxia is the condition characterized by complete absence of oxygen in the aquatic systems. Most of dead zone across the world ocean is related to anoxic condition of the marine environment caused by the natural and human induced reasons. A mass extinction of species from world's oceans is resulted from widespread anoxic condition. Based on the above statements, answer the following questions:
  - a) What are the natural and human induced reasons responsible for the anoxic condition of the marine environment? 1.5
  - b) Briefly explain the mechanism of dead zone formation in the marine environment. 2.5
  - c) Discuss the impact of widespread anoxic condition on the mass extinction of species from the world's ocean. 3.0

**Please turn over to the next page**

10. An oil spill is the release of a liquid petroleum hydrocarbon into the environment, especially marine areas from a number of point and non-point sources. When oil is spilled in the ocean water it undergoes a series of physico-chemical and biological conversion process from spreading to biodegradation. Based on the above statements, answer the following questions:
- What are the point and non-point sources of oil spill pollution in marine environment? 1.0
  - Discuss what happens to oil when it spilled in sea water. 3.0
  - Develop your own plan for clearing the oil spill in the seawater. 3.0
11. Sewage is a water-carried waste, in solution or suspension and is often categorized as blackwater and greywater. Discharges of untreated or inadequately treated sewage can cause a serious concerns in producing risks to public health. Based on the above statements, please answer the following questions:
- What do you mean by blackwater and greywater? 2.0
  - How the sewage pollution can cause a serious concerns in producing risks to public health? 2.0
  - Discuss your strategies to reduce/overcome the sewage pollution in aquatic environment. 3.0
12. Eutrophication is excessive growth of plant and algae due to the increased availability of sunlight, carbon dioxide, and nutrient fertilizers like nitrogen and phosphorus into aquatic ecosystems. Based on this statement, answer the following questions:
- Does eutrophication occur equally in every waterbody? How does eutrophication differ from the harmful algal bloom? 2.0
  - Briefly explain the impact of eutrophication in aquatic ecosystem. 2.0
  - Formulate your plan for the solution of eutrophication problem in aquatic environment. 3.0
13. Industrial pollution is now the serious threats for inland and marine waters of Bangladesh. A coordinated management plan involving government authorities as law enforcing agency, industrialists and awareness of people is utmost necessary for immediate overcome of such problem for Bangladesh. Based on these statements, answer the following questions:
- Discuss briefly why and how the industrial pollution are becoming the serious threats for inland and marine waters of Bangladesh. 3.0
  - Formulate your management plan to overcome the industrial pollution of Bangladesh by involving the people, industrialists and government. 4.0
14. Write short notes on any two of the followings: 3.5×2
- Radioactive pollution
  - Health impacts of PCBs
  - Thermal pollution
  - Ecotoxicology

**Chittagong Veterinary and Animal Sciences University, Chittagong**  
**Faculty of Fisheries**

B. Sc. Fisheries (Hons.) Year -03 Semester-01, Final Examination' 2017  
Course No:IOA-301(T), Course Title:Integrated and Organic Aquafarming (Theory)  
Total Marks: 70, Time: 3 hours

*Answer any 05 (five) questions from each section. Figures in the right margin indicate full mark. Use separate answer script for each section.*

**Section A**

1. a) What do you mean by integrated aquafarming? 2  
b) Describe the importance of integrated aquafarming in the current context of Bangladesh. 5
2. a) What are the mutual benefits of livestock-fish farming in close vicinity? 3  
b) Enumerate the constraints of integrated livestock-fish farming. 4
3. a) Write down the advantages of fish cum horticulture. 2  
b) Which kind of fish-horticulture integrated farming could be practiced in Bangladesh? 5
4. a) What do you know about biofiltre? 2  
b) Illustrate the stages to develop a biofiltre for integrated aquafarming. 5
5. a) What is IFCAS? 2  
b) How the Environmental Impact Assessment (EIA) is performed regarding integrated aquafarming? 5
6. a) How can you differentiate combined and rotational cropping of paddy field? 2  
b) Describe the technical packages of fish culture in the paddy field. 5
7. Write short notes on any 02 (two) of the following: 3.5X2=7  
a) Public health concern;  
b) IMTA; and  
c) Fry nursing in paddy field

**Section B**

8. a) What are the advantages of integrated aquafarm? 2  
b) Describe the operational management of an integrated fish cum livestock based commercial farm. 5
9. a) What is the difference between 'Aquaponics' and 'Hydroponics'? 2  
b) How will you prove 'Aquaponics have turned into a working model of sustainable fish production'? 5
10. a) What are the principles of organic aquaculture? 3  
b) Give an account of historical background of organic aquaculture. 4
11. a) 'Organic shrimp is a new potential'- Explain. 3  
b) 'Organic Aquaculture has a direct relation with the environment'- Justify. 4
12. a) What is 'Organic Inspection'? 2  
b) Describe the organic inspection system used in organic aquaculture sectors? 5
13. a) Distinguish between traditional and organic aquafarming. 3  
b) Briefly discuss about the impacts of integrated aquaculture on the livelihood. 4
14. Write short notes on any 02 (two) of the following: 3.5X2=7  
a) Principle of Aquaponics;  
b) Organic fish seed; and  
c) National Organic Program (NOP)

**Chittagong Veterinary and Animal Sciences University, Chittagong**  
**Faculty of Fisheries**

B. Sc. Fisheries (Hons.) Year -03 Semester-01, Final Examination' 2017  
Course No: IFM-301(T), Course Title: **Inland Fisheries Management (Theory)**  
Total Marks: 70, Time: 3 hours

*Answer any 5 (five) questions from each section. Figures in the right margin indicate full mark. Use separate answer script for each section.*

**Section A**

- |    |    |                                                                                        |     |
|----|----|----------------------------------------------------------------------------------------|-----|
| 1. | a) | Write down the objectives of inland fisheries management?                              | 3.0 |
|    | c) | Discuss the challenges of managing inland fisheries.                                   | 4.0 |
| 2. |    | Give your idea to restore habitat in the Kaptai lake, Bangladesh.                      | 7.0 |
| 3. | a) | Distinguish between preservation and conservation.                                     | 3.0 |
|    | b) | Explain the philosophy of the fisheries regulation.                                    | 4.0 |
| 4. | a) | How does fisheries cooperative help in fisheries management?                           | 3.0 |
|    | b) | Discuss the general principles to form a cooperative.                                  | 4.0 |
| 5. | a) | How does life history data of Hilsa fish help to manage Hilsa fisheries in Bangladesh. | 3.0 |
|    | b) | Why is Hilsa fisheries management so important in Bangladesh? – Explain.               | 4.0 |
| 6. | a) | What do you know about the Bangladesh Govt. rules related to Hilsa spawning ground.    | 3.0 |
|    | b) | Explain different types of conflicts in recreational fisheries management.             | 4.0 |
| 7. | a) | What are the key indicators to assess the achievement of sustainable livelihoods.      | 2.0 |
|    | b) | Analyze the livelihood assets of a typical fisherman.                                  | 5.0 |

**Section B**

- |     |    |                                                                                          |     |
|-----|----|------------------------------------------------------------------------------------------|-----|
| 8.  | a) | What is fish ways and fish screen?                                                       | 2.0 |
|     | b) | Briefly describe the multipurpose use of inland waterbodies.                             | 5.0 |
| 9.  |    | Make a plan for the sustainable fisheries management in the Halda River, Bangladesh.     | 7.0 |
| 10. | a) | Distinguish among rule, law and Act.                                                     | 2.0 |
|     | b) | Classify and discuss fisheries regulation.                                               | 5.0 |
| 11. |    | Analyze SWOT to develop a cooperative society of FoF 3rd batch to do fisheries business. | 7.0 |
| 12. | a) | Show the Hilsa fish sanctuary area in the map of Bangladesh.                             | 2.0 |
|     | b) | Make your recommendations for the sustainable Hilsa Fisheries in Bangladesh.             | 5.0 |
| 13. | a) | “Recreational fishing is for fun” – justify.                                             | 2.0 |
|     | b) | Make a plan for recreational fisheries management in Foy’s Lake, Chittagong.             | 5.0 |
| 14. | a) | “Sustainability is a concept often paraphrased as don’t cheat your kids”- justify.       | 3.0 |
|     | b) | Draw sustainable livelihood framework.                                                   | 4.0 |

**Chittagong Veterinary and Animal Sciences University, Chittagong**  
**Faculty of Fisheries**

B. Sc. Fisheries (Hons.) Year -03 Semester-01, Final Examination' 2017

Course No: SFB-301(T), Course Title: Shellfish Biology (Theory)

Total Marks: 70, Time: 3 hours

Answer any 5 (five) questions from each section. Figures in the right margin indicate full mark. Use separate answer script for each section.

**Section-A**

1. a) Compare between finfish and shellfish? 2.0  
b) Discuss the prospects and scope of shellfish resources in Bangladesh. 5.0
2. a) What do you mean by habit and habitat of a shellfish? 2.0  
b) Write the types of habitat required for growth and reproduction of various shellfish species with examples. 5.0
3. a) What is meant by palium? 1.0  
b) What do you know about the female reproduction system of *Pila*? 4.0  
c) How does breeding take place in *Pila*? 2.0
4. a) How will you differentiate between a freshwater giant prawn from a marine tiger shrimp? 2.0  
b) Describe the male and female reproductive system of *P. monodon*. 5.0
5. a) What do you mean by pearl? 1.0  
b) Make a list of pearl bearing oyster. 2.0  
c) Discuss the biology of pearl formation. 4.0
6. a) Make a comparative outline of cephalopoda and gastropoda. 2.0  
b) Discuss the life cycle of *Octopus*. 5.0
7. a) Distinguish a female giant mud crab from a male one. 2.0  
b) Describe the reproductive behavior of giant mud crab. 5.0

**Section-B**

8. a) Define shellfish biology. Write the objectives and outcomes of the course Shellfish Biology. 2.0  
b) Describe the present status of shellfish resources of Bangladesh. 5.0
9. a) What do you mean by shell formation and regeneration? 2.0  
b) 'Moulting and regeneration is significant for shellfish growth'. Explain the statement. 2.0  
c) Illustrate the moulting mechanism of *P. monodon*. 3.0
10. a) Write the key identifying features of Crustacea and Mollusca. 2.0  
b) Illustrate the general morphology of crustaceans. 3.0  
c) Write down the ecological importance of Crayfish. 2.0
11. a) What do you know about food and feeding habit of clam? 2.0  
b) Discuss the life cycle of clam (*M. meritrix*) with diagram. 5.0
12. a) Illustrate the morphological features of freshwater prawn. 2.0  
b) Describe the digestion process of *M. rosenbergii*. 2.0  
c) Explain the shell formation and regeneration of freshwater prawn. 3.0
13. a) What do you know about morphology, distribution, food and feeding habits of green mussel? 3.0  
b) Write about the reproduction and development of green mussel. 4.0
14. a) Define biodiversity. What are the causes of decreasing shellfish resources in Bangladesh? 3.0  
b) Mention the mitigation techniques to sustain abundance and biodiversity of shellfishes. 4.0

**Chittagong Veterinary and Animal Sciences University, Chittagong**

**Faculty of Fisheries**

B. Sc. Fisheries (Hons.) Year -03 Semester-01, Final Examination' 2017

Course No: **RSO-301 (T)**, Course Title: **Rural Sociology (Theory)**

Total Marks: 70, Time: 3 hours

*Answer any 5 (five) questions from each section. Figures in the right margin indicate full mark. Use separate answer script for each section.*

**Section-A**

1. a) Define Rural Sociology. 1.0  
b) What is the importance of Rural Sociology in the field of Fisheries? 2.0  
c) Discuss different kinds of fisheries resources in Bangladesh. 4.0
2. a) How social activities is related to environmental pollution? 2.0  
b) Discuss major causes of environmental pollution in Bangladesh. 5.0
3. a) What are the characteristics of community? 2.0  
b) How the fishermen of Bangladesh adapting to the adverse environmental condition? 3.0  
c) What is social capital? 2.0
4. a) Define gender. 2.0  
b) What are the causes of gender discrimination in the fisheries sector in the socio-economic perspective of Bangladesh? 5.0
5. a) What is social survey? 1.0  
b) Distinguish between structured and non-structured questionnaire. 2.0  
c) Briefly discuss the steps for conducting a social research. 4.0
6. a) What is migration? 2.0  
b) What are the categories of migration? 2.0  
c) Explain the causes and effects of migration? 3.0

**Section-B**

7. a) Define culture and civilization. 2.0  
b) Discuss the characteristics of culture. 2.0  
c) Narrate the factors of human development. 3.0
8. a) What is personality? 2.0  
b) Briefly discuss the role and contribution of GOs, NGOs and private sector towards agro-fishery industry development in Bangladesh. 5.0
9. a) Write down the basic characteristics of agrarian societies. 3.0  
b) Why the rural people migrate to the urban areas? Explain. 4.0
10. a) What do you mean by sustainable livelihood? 2.0  
b) What are the objectives of sustainable livelihood? 2.0  
c) Explain the core concepts of livelihood. 3.0
11. a) Explain the difference between social development and social progress. 3.0  
b) Define integrated farming system and objectives of integrated farming system. 2+2
12. Write short notes on the followings (Any two): 3.5×2  
a) Socialization      b) Social values      c) Cultural lag



**Chittagong Veterinary and Animal Sciences University, Chittagong**  
**Faculty of Fisheries**

B. Sc. Fisheries (Hons.) Year -03 Semester-01, Final Examination' 2017  
Course No: **FPI-301(T)**, Course Title: **Fish Pathology and Immunology (Theory)**  
Total Marks: 70, Time: 3 hours

*Answer any 05 (five) questions from each section. Figures in the right margin indicate full mark. Use separate answer script for each section.*

**Section A**

- |    |                                                                        |         |
|----|------------------------------------------------------------------------|---------|
| 1. | a) What do you mean by fish pathology?                                 | 2       |
|    | b) Describe the factors producing diseases in fish.                    | 5       |
| 2. | a) Distinguish between drug and chemical.                              | 2       |
|    | b) What are the criteria for selection of a drug?                      | 2       |
|    | c) Describe the role of commercial aqua drugs in aquaculture.          | 3       |
| 3. | a) Which stages are mainly followed for effective vaccine development? | 3       |
|    | b) Interpret the method of vaccine administration.                     | 4       |
| 4. | a) Distinguish immune response between fish and shrimp.                | 2       |
|    | b) Discuss the humoral factors of innate immunity in fish.             | 5       |
| 5. | a) What do you know about aquatic pharmacology?                        | 2       |
|    | b) Which factors should be considered before applying any drug?        | 5       |
| 6. | a) What do you mean by immune response and immunity?                   | 2       |
|    | b) Describe the lymphoid organs in fish.                               | 5       |
| 7. | Write short notes on any <b>02 (two)</b> of the following:             | 3.5X2=7 |
|    | a) MMC;                                                                |         |
|    | b) Opsonization; and                                                   |         |
|    | c) ELISA                                                               |         |

**Section B**

- |     |                                                                                               |         |
|-----|-----------------------------------------------------------------------------------------------|---------|
| 8.  | a) Define lymphoid organ, lymph and lymph nodes.                                              | 2       |
|     | b) What are the main differences between specific and non-specific immunity in fish?          | 5       |
| 9.  | a) What are the characteristics of an ideal immunostimulant?                                  | 3       |
|     | b) Describe $\beta$ -glucan as an immunostimulant in fish.                                    | 4       |
| 10. | a) Evaluate the pathogenesis of fish virus and bacteria.                                      | 2       |
|     | b) Describe MAS in fish with its etiology, sign, symptom and control measures.                | 5       |
| 11. | a) What are the functions of fish immunoglobulin?                                             | 2       |
|     | b) Discuss the mechanism of immunoglobulin formation in fish.                                 | 5       |
| 12. | a) Classify basic pharmacology.                                                               | 2       |
|     | b) Elaborate drug-body interaction in case of drug action.                                    | 5       |
| 13. | a) Distinguish between active and passive immunization.                                       | 2       |
|     | b) Give a comparison between chemotherapy and vaccination for disease prevention and control. | 5       |
| 14. | Write short notes on any <b>02 (two)</b> of the following:                                    | 3.5X2=7 |
|     | a) T-Lymphocyte;                                                                              |         |
|     | b) Monoclonal antibody; and                                                                   |         |
|     | c) SVC                                                                                        |         |