Chittagong Veterinary and Animal Sciences University, Chittagong
Faculty of Fisheries

B. Sc. Fisheries (Hons.) Year-04 Semester 01, Final Examination' 2016

Course code: **QCF-401(T),** Course Title**: Quality Control of Fish and Fishery Products (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)	Define quality.	2.0
	b)	Write down the importance of quality control in fish processing industry.	2.0
	c)	Write down the old and new concept of quality.	3.0
2.	a)	Differentiate between quality deterioration and extrinsic quality defects with examples.	2.0
	b)	What do you mean by intrinsic quality of fish with examples?	1.0
	c)	Describe the factors that affect the intrinsic quality of fish.	4.0
3.	a)	Write a brief bacteriological change occur in fish after death.	1.5
	b)	Write in brief lipid oxidation and hydrolysis during most-mortem changes.	1.5
	c)	List down the factors that affect the extrinsic quality of fish.	2.0
	d)	Write in brief the major organoleptic quality attributes of fish.	2.0
4.	a)	Write down the organogram of FIQC.	3.0
	b)	Write down the inspection activities of FIQC.	2.0
	c)	What are the pre-requisites for issuing health certificates of shrimp for export?	
5.	a)	Why emphasis has been given for maintenance of hand washing, hand sanitizing and toilet in a fish processing industry? Justify your answer.	2.0
	b)	Write in brief some common pre-requisite programs in a fish processing industry.	2.0
	c)	Write in brief about contact surface and cross contamination aspects of sanitation.	3.0
6.	a)	Enlist eight (08) key areas of sanitation.	1.0
	b)	Briefly describe the various aspects of sanitation in a fish processing industry.	5.0
	c)	Write down the importance of foot dip in a fish processing industry.	1.0
7.	a)	Define HACCP.	1.0
	b)	Write systematically seven principles of HACCP.	3.0
	c)	Write in brief five preliminary steps of HACCP.	3.0

Section-B

8.	a)	Write in brief the growth factors of bacteria.	1.5
	b)	List some spore and non-spore forming bacteria.	1.5
	c)	Write in brief control measures for *Clostridium botulinum, Salmonella, Staphylococcus vibrio, Listeria.*	4.0
9.	a)	Differentiate between infection and intoxication.	1.5
	b)	Write down the controls for chemical contamination of seafood.	2.5
	c)	Write down briefly the unintentionally and intentionally added chemicals found in seafood.	3.0
10.	a)	Write briefly the five steps of hazard analysis.	1.5
	b)	Write down the controls for chemical contamination of seafood.	2.5
	c)	Write in brief some process and species related hazard in seafood.	3.0
11.	a)	Categorize hazards with example.	1.0
	b)	Write down some points where hazards can be prevented, eliminated and reduced to acceptable levels.	4.0
	c)	Give examples of multiple hazards and single CCP, and single hazard and multiple CCP.	2.0
12.	a)	What are the causes of defects in salted fish? How do you prevent it?	3.0
	b)	Briefly describe the microbiological quality deterioration in salted fish.	4.0
13.	a)	Define disinfection and disinfectants.	2.0
	b)	Write down the characteristics of an ideal disinfectant.	2.0
	c)	Draw a table showing chlorinated disinfectants with their types, key ingredients, application and limitations to use in a processing industry.	3.0
14.	a)	Write down the importance of safe handling of fish.	2.0
	b)	Describe features of an anesthetics.	2.0
	c)	What do you mean by conditioning of fish? Write down the importance of conditioning of fish during live fish transportation.	3.0

Chittagong Veterinary and Animal Sciences University, Chittagong

Faculty of Fisheries

B. Sc. Fisheries (Hons.) Year-04 Semester 01, Final Examination' 2016

Course code: **MRE-401(T),** Course Title**: Mangrove Resources (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 mangrove fisheries?	1.0
	b)	State the development stages of mangrove forest especially Sundarban Mangrove forest.	3.0
	c)	Briefly discuss some special characteristics of mangrove forest.	3.0
2.	a)	Specify the goods and services of mangrove forest.	2.0
	b)	Illustrate the major categories of mangrove forest.	3.0
	c)	Write in brief how mangrove forest protects the southwestern coastal belt of Bangladesh.	2.0
3.	a)	What are the mangrove aquatic resources?	1.0
	b)	Write in brief on aquatic resources with stock assessment in mangrove ecosystem.	3.0
	c)	Briefly discuss the environmental issues related to mangrove fisheries management.	3.0
4.	a)	What do you mean by "biodiversity in mangrove ecosystem"?	2.0
	b)	Briefly discuss floral and faunal diversity of Sundarban Reserve Forests.	5.0
5.	a)	What do you mean by ecological succession?	2.0
	b)	Specify general pattern of plant succession with a reference flow diagram.	2.0
	c)	Illustrate the food chain of mangrove ecosystem in Sundarbans.	3.0
6.	a)	What are the aquatic resources available in Sundarban mangrove ecosystem?	3.0
	b)	How mangrove fisheries contribute in national economy in Bangladesh?	4.0
7.	a)	What are the key problems in Sundarban Reserve Forest (SRF) management in Bangladesh?	3.0
	b)	Write your recommendations for the sustainable sundarban management.	4.0

Section-B

8.	a)	Define mangrove restoration and regeneration.	2.0
	b)	What are the major goals of restoration of mangrove habitats?	2.0
	c)	Discuss site selection criteria for mangrove restoration.	3.0
9.	a)	What do you mean by "people's participation" in Sundarban management?	1.0
	b)	What are the stakeholders associated with the Sundarban Reserve Forest?	2.0
	c)	Briefly discuss the pros and cons of co-management in SRF in Bangladesh.	4.0
10.	a)	Classify ecological zonation of mangrove forest on the basis of salinity level.	2.0
	b)	What do you mean by pneumatophore?	1.0
	c)	Discuss various kinds of pneumatophores development in mangrove ecosystem?	4.0
11.	a)	Define mangrove zonation.	1.0
	b)	Write down the hydrodynamic characteristics of mangrove settings including fringe, riverine, basin and dwarf types.	4.0
	c)	What are the biological characteristics of mangrove forest?	2.0
12.	a)	Specify the coastal forest types of Bangladeshi coast.	2.0
	b)	Discuss about the mangrove biodiversity of Sunderban Mangrove Forest.	2.0
	c)	What are the major hydro-meteorological and biological factors affecting the biodiversity in mangrove fisheries?	3.0
13.	a)	What are the major threats to mangroves?	2.0
	b)	Discuss briefly about the causes of mangrove degradation and destruction.	3.0
	c)	What are the impacts of shrimp farming on mangrove forest with special reference to Chakaria Sundarban in Bangladesh?	2.0
14.	Write short note on **any 2 (two)** of the following:		3.5×2=7.0
	a)	Cryptoviviparous germination	
	b)	Protected Areas Management	
	c)	Conservation strategies of mangrove fisheries	
	d)	Chakoria Sundarban	

Chittagong Veterinary and Animal Sciences University, Chittagong
Faculty of Fisheries
B. Sc. Fisheries (Hons.) Year -04 Semester-01, Final Examination' 2016
Course No: 4**01 (T)**, Course Title: **Algal Biotechnology (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 micro-algae and macro-algae.	2.0
	b)	'Algae are not classified as plant' –justify.	2.0
	c)	Write down the importance of studying 'Algal Biotechnology' in Fisheries.	3.0
2.	a)	Write down commercial uses of red algae.	3.0
	b)	What makes red algae as red?	2.0
	c)	Define harmful algae.	2.0
3.	a)	Briefly discuss biodiesel production system from microalgae.	3.0
	b)	What do you mean by algal toxins?	2.0
	c)	Enlist toxic compounds found in algae.	2.0
4.	a)	What do you mean by bio-fuel?	1.0
	b)	What are the advantages of using bio-fuel?	2.0
	c)	Briefly discuss energy conversion process with appropriate flow diagram.	4.0
5.	a)	'Natural antioxidant is better than synthetic antioxidant' – justify the statement.	2.0
	b)	What is schistosomiasis? How do microalgae prevent schistosomiasis?	3.0
	c)	Write short notes on nematicidal activity of microalgae.	2.0
6.	a)	How agar is isolated from marine algae?	2.0
	b)	Write down the properties of agar.	2.0
	c)	Give a brief account on application of agaroses on electrophoresis and chromatography.	3.0
7.	a)	What is phycoremediation?	2.0
	b)	Write short notes on blue nutraceuticals.	2.0
	c)	Explain the factors responsible for bioremediation process.	3.0

Section - B

8.	a)	What is algin?	1.0
	b)	Briefly discuss extraction procedure of algin from macro-algae.	3.0
	c)	Write down properties and application of algin.	3.0
9.	a)	Classify macro-algae on the basis of pigmentation and differentiate among them.	3.0
	b)	Briefly describe appropriate habitat of macro-algae.	2.0
	c)	What are the beneficial uses of macro-algae.	2.0
10.	a)	What is trans-esterification? Give the equation of biofuel production through this process.	3.0
	b)	Enlist 6 (six) species that are used to produce bio-diesel.	3.0
	c)	What types of algae should choice for bio-ethanol production?	1.0
11.	a)	What do you mean by algal metabolis?	2.0
	b)	Diagrammatically show biosynthesis process of EPA and DHA.	3.0
	c)	Enlist 5 (five) sterols found in micro-algae.	2.0
12.	a)	'Micro-algae can be a biological of pathegonic microbes' – justify.	2.0
	b)	Briefly discuss the uses of micro-algae in mitigation of CO_2 emissions.	2.0
	c)	Give a schematic diagram of micro-algae cultivation system.	3.0
13.	a)	What is biomedicine?	1.0
	b)	Briefly state the therapeutic, nutraceutical and cosmoceutical uses of algae.	6.0
14.	a)	Illustrate photo-bioreactor system of micro-algae culture with their advantages and disadvantages.	3.0
	b)	Discuss the factors limiting micro-algal growth and enumerate optimum level of those factors.	4.0

Chittagong Veterinary and Animal Sciences University, Chittagong
Faculty of Fisheries

B. Sc. Fisheries (Hons.) Year -04 Semester-01 Final Examination' 2016

Course No: **FEX-401 (T)**, Course Title: **Fisheries Extension**

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 is meant by extension education?	1.5
	b)	Extension is a continuous educational process where both learner and teacher contribute and receive- justify the statement.	3.0
	c)	Why do you think that extension education is important for fisheries development work in Bangladesh?	2.5
2.		What do you mean by philosophy of agricultural extension? Enumerate the philosophies of agricultural extension work and discuss in brief any one of those philosophies.	7.0
3.	a)	What is adopter category?	2.0
	b)	Mention the features of two adopter categories which you think important in fisheries extension work.	5.0
4.	a)	What is extension teaching?	1.0
	b)	Classify extension teaching methods based on use with examples.	2.0
	c)	Suppose you are working as Upazila Fisheries Officer at Anwara upazila, Chittagong. There is a massive outbreak of EUS disease of fish in your upazila. In this connection, you want to teach farmers to overcome this situation. Which teaching method(s) would you like to consider and why?	4.0
5.	a)	What do you mean by communication?	1.0
	b)	Define message. Write down the salient features of good message selected for the farmers.	3.0
	c)	Show Berlos' model of communication in a neat diagram and mention the drawback of this model.	3.0
6.		Write short note on the following-	
	a)	Farm and home visit	3.5
	b)	Local leaders in Fisheries Extension.	3.5

Section-B

7.	a)	Define organization with examples.	2.0
	b)	Write down the qualifications and duties of UFO working under Department of Fisheries.	5.0
8.	a)	What is meant by innovation?	1.0
	b)	State the salient features of an innovation.	3.0
	c)	Draw the innovation decision process in a neat diagram.	3.0
9.	a)	Define learning. Which element is the most important and why?	3.0
	b)	State the law of exercise with its implications in fisheries extension work.	4.0
10.	a)	What do you mean by leadership?	1.0
	b)	Why do people get interested to work as local leader?	2.0
	c)	Extension workers are professional leaders-Why?	4.0
11.	a)	Define special interest groups in extension with examples.	2.0
	b)	As an Upazila Fisheries Officer how will you plan to utilize the rural youth living around a big water body of your upazila for fisheries development?	5.0
12.	a)	Define monitoring and evaluation.	2.5
	b)	How you can evaluate an extension programme?	4.5

Chittagong Veterinary and Animal Sciences University, Chittagong
Faculty of Fisheries

B. Sc. Fisheries (Hons.) Year-04 Semester-01, Final Examination' 2016

Course code: **MGE-401(T),** Course Title**: Molecular Biology and genetic Engineering (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)	Define molecular biology and genetic engineering.	2.0
	b)	Write the potential applications of genetic engineering and biotechnology in fisheries.	5.0
2.	a)	What is restriction endonuclease?	2.0
	b)	Make a list of five restriction enzymes with their source, recognition sequence and cutting sequences.	5.0
3.	a)	What is PCR?	1.0
	b)	Write the principle of PCR.	2.0
	c)	Briefly describe the steps of PCR with examples.	4.0
4.	a)	What is cDNA ?	1.0
	b)	Briefly describe the procedure of creating a cDNA library.	6.0
5.	a)	Show the general features of a eukaryotic gene with a labeled diagram.	2.0
	b)	Describe the methods of gene transfer in fish.	5.0
6.	a)	Write the principle of RAPD technique.	2.0
	b)	Describe the RAPD analysis method.	4.0
	c)	What are the disadvantages of RAPD?	1.0
7.	a)	Discuss the bioethical issues of biotechnological applications.	3.0
	b)	Why transgenic fish is considered safe for human consumption?	4.0

Section-B

8.	a)	What do you know about molecular markers?	2.0
	b)	Describe RFLP as a molecular marker.	5.0
9.	a)	What is blotting?	1.0
	b)	Distinguish between Southern and Northern blotting.	2.0
	c)	What are the applications of different blotting techniques?	4.0
10.	a)	What do you mean by recombinant DNA?	1.0
	b)	Briefly describe the procedure of producing a recombinant DNA molecule.	6.0
11.	a)	Define electrophoresis.	2.0
	b)	Write down the theory of electrophoresis.	3.0
	c)	What are the applications of electrophoresis?	2.0
12.	a)	Mention the major steps of gene regulation in eukaryotes.	2.0
	b)	Discuss how alternative RNA splicing regulates gene expression.	2.5
	c)	Discuss the RNA transport control mechanism.	2.5
13.	a)	What do you mean by transgenesis?	1.0
	b)	Briefly describe the essential steps to be considered for transgenic fish production.	6.0
14.	Write short notes on (any two) the followings:		3.5×2.0=7.0

a. Microsattelite
b. Mobile genetic elements
c. Operon
d. Northern blotting

Chittagong Veterinary and Animal Sciences University, Chittagong
Faculty of Fisheries

B. Sc. Fisheries (Hons.) Year -04 Semester-01 Final Examination' 2016

Course No: **FEN-401 (T)**, Course Title: **Fish Endocrinology**

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)	Define endocrinology.	1.0
	b)	Write down the importance of studying endocrinology in fisheries science.	3.0
	c)	Diagrammatically show the location of different endocrine glands found in fishes.	3.0
2.	a)	What is feedback system?	2.0
	b)	Diagrammatically show the mechanism of hormone release in a fish body.	5.0
3.	a)	Define neuroendocrinolgy and neurosecretion.	2.0
	b)	Briefly describe the neural regulation of hormone synthesis in fish.	5.0
4.	a)	What are the classes of hormones?	3.0
	b)	Mention the names of anterior pituitary hormones along with their functions.	4.0
5.	a)	Differentiate between endocrine and exocrine glands.	2.0
	b)	Name the major endocrine organs, their secretions and functions.	5.0
6.	a)	What do you know about vitellogenesis?	2.0
	b)	Briefly describe the endocrine control of vitellogenesis.	5.0
7.	Write short notes on **any 2 (two)** of the following: a. HPG axis, b. Seminiferous tubule, and c. Pineal gland		3.5×2=7.0

Section-B

8.	a)	Define endocrine system.	1.0
	b)	Compare and contrast the human and fish endocrine system.	4.0
	c)	The pancreas is both an endocrine gland and digestive organ- Explain.	2.0
9.	a)	What do you know about peptide hormone?	2.0
	b)	Briefly describe the peptide hormone synthesis and release with diagram.	5.0
10.	a)	What are the functions of growth hormones?	3.0
	b)	How is the GH synthesized, secreted and transported in blood?	4.0
11.	a)	Define hormone, ligand and receptors.	3.0
	b)	Pituitary is called the master gland- Explain.	2.0
	c)	Write down the role of hormone in aquaculture.	2.0
12.	a)	Write down the functions of testosterone in fish.	2.0
	b)	Briefly describe the hormonal regulation of spermatogenesis in fish.	5.0
13.	a)	What are the different types of ovarian organization found in fish?	2.0
	b)	Briefly describe the hormonal control of ovarian maturation in fish.	5.0
14.	Write short notes on **any 2 (two)** of the following: a. Neurotransmitters, b. Steroid hormone, and c. Pancreas		3.5×2=7.0

Chittagong Veterinary and Animal Sciences University, Chittagong

Faculty of Fisheries

B.Sc. Fisheries (Hons.) Year-04 Semester 01, Final Examination' 2016

Course code: **FRP-401(T),** Course Title**: Fisheries Research and Planning (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)	Define Research.	1.0
	b)	Depict the research process in a general way.	2.0
	c)	"Research generates *new* knowledge" – what is meant by *new* here?	4.0
2.	a)	Characterize the purpose of research.	1.0
	b)	Mention the various research levels.	2.0
	c)	Describe the steps in which a problem could be solved.	4.0
3.	a)	Name the types of research usually carried out in life sciences.	3.0
	b)	Write down the potential sources of confusion in an experiment and means of minimizing their effects.	4.0
4.	a)	Define Z-source.	1.0
	b)	Describe the relationship between standard deviation of sample means and standard deviation of the population being sampled.	3.0
	c)	The mean of a random sample of 40 new mobile homes is 24.31 in thousand dollars. Obtain a 99.74% confidence interval for the mean price of all new mobile homes. Assume the population standard deviation of the prices is $7200.	3.0
5.	a)	What is scientific paper?	1.0
	b)	Distinguish between conference report and meeting abstracts.	2.0
	c)	What are the essential features of a good discussion?	4.0
6.	a)	What is socioeconomic assessment? Mention its types.	3.0
	b)	How do you plan field data collection phase in a socioeconomic assessment?	4.0
7.	Write short notes on any **02 (two)** of the following:		3.5 X 2.0 = 7.0
	a)	Probability sampling techniques;	
	b)	Confidence interval for a normal population mean;	
	c)	Tense in scientific writing.	

Section-B

8.	a)	What do you mean by experiment?	2.0
	b)	Describe briefly an experiment for example to be set in a laboratory of FoF, CVASU.	5.0
9.	a)	What is standard error?	1.0
	b)	State Chebychev's rule. What does Chebychev's rule say about the percentage of data that lies within 1.40 standard deviations of a data set.	3.0
	c)	How do you choose research hypothesis in fisheries research?	3.0
10.	a)	What does "Abstract" of a scientific paper state?	2.0
	b)	Mention the suggested rules for a good introduction of a scientific paper.	4.0
	c)	What is a review paper?	1.0
11.	a)	What does SWOT stand for? Define it.	2.0
	b)	Give the detail description of SWOT analysis of a project you studied.	5.0
12.	a)	Mention the steps of a research project.	2.0
	b)	Define model formulation. Name the levels of variation involved in subject universe.	3.0
	c)	Why do you check research findings against the original model?	2.0
13.	a)	What is participation in fisheries research?	2.0
	b)	Describe the typology of participation in development programs.	5.0
14.	Write short notes on any **02 (two)** of the following:		3.5 X 2.0 = 7.0
	a)	Observational studies;	
	b)	Steps in project monitoring and evaluation;	
	c)	Commandments of good writing.	

Chittagong Veterinary and Animal Sciences University, Chittagong
Faculty of Fisheries

B. Sc. Fisheries (Hons.) Year-04 Semester 01, Final Examination' 2016

Course code: **PAH-401(T),** Course Title**: Population Approaches in Aquatic Animal Health and Production (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)	Define epidemiology. What are the major objectives of epidemiology?	3.0
	b)	Briefly describe the chronological advancement of epidemiological study.	2.0
	c)	What are the major applications of epidemiology?	2.0
2.	a)	How can you define sample size and population?	2.0
	b)	Illustrate the stages in sample selection with relevant flowchart.	3.0
	c)	Explain the mechanisms of non-infectious diseases.	2.0
3.	a)	Define the term incidence, cumulative incidence and incidence rate.	3.0
	b)	How you will measure cumulative incidence and incidence rate?	2.0
	c)	What is the relationship between cumulative incidence and incidence rate?	2.0
4.	a)	What do you mean by disease surveillance?	2.0
	b)	Specify the scientific principles of disease surveillance in fish.	3.0
	c)	Briefly discuss the limitations of surveillance for aquatic disease in Bangladesh.	2.0
5.	a)	Define uncertainty in risk assessment.	1.0
	b)	Illustrate the procedural steps of risk analysis.	3.0
	c)	Briefly discuss and construct a risk assessment model in the field of fisheries.	3.0
6.	a)	How can you define geographic information system (GIS)?	2.0
	b)	What are the scopes of GIS technology in the field of Marine Bioresources Science?	3.0
	c)	Illustrate the metric properties of maps used in GIS analysis.	2.0
7.	a)	Specify the sources of data for geographic datasets.	2.0
	b)	State the types of geodatasets including points and cell.	2.0
	c)	What is remote sensing and why use it in fisheries sector?	3.0

Section-B

8.	a)	What is risk analysis? Write some applications of risk analysis.	2.0
	b)	What are the basic principles of risk analysis?	2.0
	c)	Explain the various steps involved in risk analysis.	3.0
9.	a)	Specify the triads' characteristics in epidemiological study.	2.0
	b)	How many diverse epidemiological studies do you know?	3.0
	c)	What are the major stages in epidemiological study?	2.0
10.	a)	What are the major differences between surveillance and monitoring?	2.0
	b)	State the relationship among various components of surveillance program.	4.0
	c)	Illustrate the network used in the surveillance activities.	1.0
11.	a)	Mention the essential components of a GIS map.	4.0
	b)	Discuss the application of RS and GIS in i) Resource classification, ii) Biodiversity mapping, and iii) Changes in coastline and bathymetry.	3.0
12.	a)	What do you mean by Geo-referencing?	2.0
	b)	Illustrate the components of spatial analysis for vectoral objects.	2.0
	c)	What are the essential data for marine fisheries management in respect of GIS analysis?	3.0
13.	a)	What is hybrid GIS?	1.0
	b)	Briefly discuss the some essential modern marine equipment used in the field of marine fisheries related to GIS.	3.0
	c)	Illustrate the application of GIS in aquatic resource identification.	3.0
14.	Write short note on **any 2 (two)** of the following:		3.5×2=7.0
	a)	Infectivity,	
	b)	Ground truthing,	
	c)	Geoids verses ellipsoid, and	
	d)	Prevalence.	

Chattogram Veterinary and Animal Sciences University, Chattogram
Faculty of Fisheries
B. Sc. Fisheries (Hons.) Year -4 Semester-1, Final Examination' 2019
Course No: **MGE-401 (T)**, Course Title: **Molecular Biology and Genetic Engineering (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 molecular biology and biotechnology.	1
	b)	Justify the significance of studying molecular biology and genetic engineering in fisheries.	2
	c)	Explain how the knowledge of molecular biology and genetic engineering can enhance sustainability of Fisheries sector.	4
2.	a)	Describe the functions of restriction endonucleases.	2
	b)	Enlist five restriction endonucleases with their source, cutting site with the indication of number of base cutter and cutting sequences.	5
3.	a)	What is PCR? Write the principle of PCR.	2
	b)	Explain the procedural steps of PCR with example.	5
4.		Discuss in details the construction and screening of cDNA library.	7
5.	a)	What is meant by dominant and co-dominant marker?	2
	b)	Write the principle of RFLP marker. Mention advantages and disadvantages of RFLP marker.	5
6.	a)	What is recombinant DNA? Write the applications of recombinant DNA.	2
	b)	Explain how would you create and screen recombinant DNA.	5
7.	a)	What is blotting? Mention the blotting techniques with their purpose.	2
	b)	Write the principle of Western blotting. Mention its applications.	3
	c)	Differentiate between Southern blotting and Western blotting.	2

Section B

8.	a)	What is molecular marker? Make a list of molecular markers widely used in fish genetic study.	2
	b)	How will you use molecular markers in genetic study and conservation of fish population?	5
9.	a)	Define electrophoresis. Write the principle of gel electrophoresis.	3
	b)	What are the factors affecting migration of nucleic acids during electrophoresis?	2
	c)	Write the functions of agaorose gel, sodium dodecyl sulphate, ethidium bromide in electrophoresis.	2
10.	a)	Differentiate transient transformation from stable transformation of gene.	2
	b)	Explain the methods of bacterial transformation and retroviral transduction.	5
11.	a)	List the artificial methods of DNA transfer.	2
	b)	Describe the principle of electroporation and microinjection with their advantages and disadvantages.	5
12.	a)	Define the following terms: exon; promoter and enhancer.	2
	b)	Illustrate the general features of a eukaryotic protein coding gene.	5
13.	a)	What is meant by gene expression and why regulation of gene expression is necessary?	1
	b)	Mention the steps at which expression of a gene is regulated.	2
	c)	Explain the mechanism of post-transcriptional regulation of gene expression.	4
14.		Write down short notes on any ***02 (Two)*** of the following: i) Mobile genetic elements; ii)) Cloning vectors; iii) Southern blotting	3.5 × 2 = 7