KHULNA UNIVERSITY

School: Life Science **Discipline:** Fisheries and Marine Resource Technology **Program:** BSc in Fisheries (Honours)

Year: 3rd **Term:** 2nd **Examination year:** 2026 **Session:** 2024-2025

Course code: 0831 06 FMRT 3201 **Course Title:** Fish Population Dynamics

Total Marks: 60 **Time:** 3.0 hrs **Credit:** 3.0

*The parentheses at the end of the questions represent level of Bloom's cognitive domain and course learning outcomes.
*The figures in the margin indicate full marks. The questions are of equal value.
*Use separate answer script for each section.

SECTION-A

There are **FOUR** questions in this section. Answer any **THREE** questions

Q.1 a) "Fish population dynamics helps to determine the level of abundance of major fish species, the current level of catch, and fishing efforts."- Justify the statement with an example. [L1; CLO1] **03**

b) State the advantages and limitations of maximum sustainable yield (MSY). [L2; CLO1] **03**

c) Narrate the basic population parameters of a fish stock. [L3; CLO1] **04**

Q.2 a) Define bycatch, biomass, and carrying capacity? [L2; CLO2] **03**

b) Mention the importance of studying the length-weight relationship (LWR) of a fish stock. [L4; CLO2] **03**

c) Describe different types of condition factors with their importance. [L3; CLO2] **04**

Q.3 a) Describe different types of growth with examples. [L5; CLO2] **03**

b) How shall you determine the age of a fish by observing the fish's scales? [L6; CLO2] **04**

c) How does the von Bertalanffy growth equation establish a relationship between age and growth? Explain. [L6; CLO2] **03**

Q.4 a) "Each individual organism exists as the result of reproduction."-Justify. [L4; CLO3] **03**

b) What is meant by fish fecundity? How shall you estimate fish fecundity? [L5; CLO4,5] **03**

c) Narrate your ideas regarding fish stock assessment with suitable examples. [L6; CLO6] **04**

SECTION-B

There are **FOUR** questions in this section. Answer any **THREE** questions

Q.5 a) Illustrate the importance of estimating mortality and recruitment in fish population dynamics [L2; CLO6] **03**

b) Distinguish between Schaefers and Fox model of SPM. [L4; CLO6] **02**

c) Enlist the MSY estimating models? [L1; CLO10] **02**

d) Calculate Catch, MSY and F_{msy} following Schaefers' model when the constant and slope between CPUE and effort are 2.5 and -0.00005 respectively and the effort is 1000 hmnd. [L4; CLO10] **03**

Q.6 a) What is mean length at recruitment? How do you estimate this recruitment? [L1,3; CLO7] **04**

b) Differentiate between 'Beverton and Halt model' and 'Shepherd and Schnute model'. [L4; CLO7] **03**

c) What is instantaneous total mortality? Mention a list of process for estimating fish mortality. [L1,2; CLO7] **03**

Q.7 a) Construct an example estimating age from length frequency data. [L3; CLO7] **02**

b) Which data will you exclude in fitting regression line during the estimation of total mortality following length converted catch curve? [L2; CLO7] **02**

c) Tagged fish caught over 5 years of constant fishing effort, after an initial 400 fish tagged. Estimate instantaneous mortality coefficient from the following data set. **06**

Months:	0-6	6-12	12-18	18-24	24-30
Tagged fish caught:	50	40	30	20	10

[L5; CLO7]

Q.8 Write short note on the followings [L1; CLO11,12] **2.5x4 = 10**

a) Fishery models; b) Over fishing; c) Ricker curve; d) CPUE.

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School: Life Science **Discipline:** Fisheries and Marine Resource Technology **Program:** BSc in Fisheries (Honours)
Year: 3rd **Term:** 2nd **Examination year:** 2026 **Session:** 2024-2025
Course code: 0831 06 FMRT 3203 **Course Title:** Fish Breeding and Hatchery Management
Total Marks: 60 **Time:** 3.0 hrs **Credit:** 3.0

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*Use separate answer script for each section.

SECTION-A

There are **FOUR** questions in this section. Answer any **THREE** questions

Q.1	**a)**	Distinguish between natural breeding and induced breeding. [L4; CLO1]	**03**
	b)	"Induced spawning is the prerequisite for advanced aquaculture." Justify. [L5; CLO1]	**04**
	c)	Explain the mating behavior and natural spawning of any major carp. [L6; CLO1]	**03**
Q.2	**a)**	What measures should be taken to produce good quality and healthy brood? [L1; CLO2]	**02**
	b)	Discuss the brood fish selection, transportation and management techniques of an Indian major carp (IMC). [L6; CLO2]	**05**
	c)	Distinguish between mature male and female fish. [L4; CLO2]	**03**
Q.3	**a)**	What factors should you consider for selecting a hatchery site? [L1; CLO2]	**02**
	b)	Draw a model of a fish hatchery showing the different fundamental units. [L3; CLO3]	**04**
	c)	List five commercially important catfish with common and scientific names. Interpret the brood management of any indigenous catfish. [L6; CLO3]	**04**
Q.4	**a)**	What precautions should be maintained when harvesting shrimp breeders from the deep sea? [L3; CLO2]	**03**
	b)	What are the potential risks of using wild-caught brood fish in hatcheries? [L4; CLO1]	**03**
	c)	Give an account on live food cleaning and water exchange system. [L2; CLO4]	**04**

SECTION-B

There are **FOUR** questions in this section. Answer any **THREE** questions

Q.5	**a)**	State the concept of 'inbreeding' and 'negative selection' in hatchery. [L2; CLO7]	**03**
	b)	Provide some suggestions to minimize the risk of negative selection and inbreeding occurring in the carp hatcheries of Bangladesh. [L6; CLO7]	**04**
	c)	What do you mean by cryopreservation? Mention the factors to consider in the gamete cryopreservation of fish. [L2; CLO8]	**03**
Q.6	**a)**	Provide a comparative statement on the basic types of prawn hatcheries. [L4; CLO5]	**02**
	b)	What techniques will you use to transport broodstock of *Macrobrachium rosenbergii* for hatchery purposes? [L2; CLO5]	**03**
	c)	Discuss the seed production techniques for mud crab, *Scylla olivacea*, in hatcheries, focusing specifically on brood management, spawning, hatching, and larval rearing. [L2; CLO5]	**05**
Q.7	**a)**	Outline the methods of eye-stalk ablation in brood shrimp. [L2; CLO7]	**03**
	b)	Identify the major factors affecting hatching success and nauplii quality in shrimp hatcheries. [L4; CLO7]	**03**
	c)	Discuss the common hatchery protocols for the induced spawning of Asian walking catfish, *Clarias batrachus.* [L2; CLO6]	**04**
Q.8		Write short note on the followings: [L2; CLO7] a) SPF shrimp stock; b) Super male; c) PG; d) Biosecurity.	**2.5x4 = 10**

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Year: 3rd **Term:** 2nd **Examination year:** 2026 **Session:** 2024-2025

Course code: 0831 06 FMRT 3207 **Course Title:** Fish Parasitology and Disease

Total Marks: 60 **Time:** 3.0 hrs **Credit:** 3.0

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SECTION-A

There are **FOUR** questions in this section. Answer any **THREE** questions

Q.1	**a)**	Define parasite. Describe the concept of parasitism. [L1,2; CLO1]	**04**
	b)	Write down the significance of understanding fish parasitology in sustainable aquaculture practice. [L2, CLO2]	**03**
	c)	How can symbiosis be related to parasitism? [L1; CLO3]	**03**
Q.2	**a)**	What is facultative parasite? How does it differ from pseudoparasitism? [L1,2; CLO3]	**03**
	b)	Explain the term transovarian in the case of continuous parasitism with a suitable example. [L3,4; CLO3]	**04**
	c)	Discuss the alternation of a parasitic life stage with a free-living generation. [L3,4; CLO3]	**03**
Q.3	**a)**	What is the spatial relationship between parasites and their hosts? Explain with examples. [L1,2; CLO4]	**03**
	b)	"Haemoparasites are a type of endoparasite." – Justify. Describe the origin of haemoparasitism. [L4; CLO4]	**04**
	c)	How can ectoparasites be explained as descendants of ancestral forms? [L4, CLO4]	**03**
Q.4	**a)**	What specialized attachment organs are found in parasites? Explain how these structures facilitate parasitism. [L1,2; CLO3]	**03**
	b)	How do parasites adapt morphologically in adverse situations? [L5; CLO4,5]	**04**
	c)	Compare and contrast facultative parasites and obligate parasites. [L4, CLO4]	**03**

SECTION-B

There are **FOUR** questions in this section. Answer any **THREE** questions

Q.5	**a)**	Narrate how conjugation reproduction differs from the syngamy reproduction of parasites? [L1, CLO6]	**03**
	b)	Briefly describe reproduction system of a cestode fish parasite causing zoonotic diseases. [L2, CLO6]	**04**
	c)	"Trematodes often use snails as their first intermediate host." – Justify your statement in the context of reproductive behaviour. [L4, CLO6]	**03**
Q.6	**a)**	Define "host" and "host specificity". [L1, CLO8]	**02**
	b)	Discuss how development stages of parasites determine host-specificity. [L4, CLO8]	**03**
	c)	Discuss how host life mode and ecological conditions determine parasitic infestation in fishes. [L4, CLO8]	**05**
Q.7	**a)**	Define 'Nutritional environment' and 'Inhibitory environment' in parasitism. [L1, CLO7]	**02**
	b)	'Parasitic infection sensitizes fishes and facilitates other diseases' – justify. [L2, CLO7]	**03**
	c)	Assess the reactions exerted by fishes being infested by endoparasites. [L5, CLO7]	**05**
Q.8		Write short note on the following: [L4, CLO1,2,7,10]	**4x2.5 = 10**
		i) Evolution of parasitic species; ii) Skin fluke iii) Relative natural insusceptibility; iv) Ich disease	

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Year: 3rd **Term:** 2nd **Examination year:** 2026 **Session:** 2024-2025

Course code: 0511 06 BGE 3251 **Course Title:** Principles of Genetics

Total Marks: 60 **Time:** 3.0 hrs **Credit:** 3.0

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SECTION-A

There are **FOUR** questions in this section. Answer any **THREE** questions

Q.1	a)	Define the terms: i) Gene, ii) Allele and iii) Genomics. [L1; CLO1]	03
	b)	Discuss the applications of genetics for aquaculture and fisheries management. [L2; CLO2]	04
	c)	"Genetics acts as the foundational pillar of biology." Justify the statement. [L2; CLO2]	03
Q.2	a)	What is cytogenetics? Explain the scope and importance of cytogenetics. [L2; CLO3]	04
	b)	How does cytogenetics differ from molecular genetics? [L3; CLO2]	03
	c)	What do you know about chromosomal rearrangement in fish? [L1; CLO1,2]	03
Q.3	a)	Distinguish between genetic and temperature dependent sex determinations. [L3; CLO3]	03
	b)	Enlist the sex-determining genes in fish and their corresponding functional roles. [L2; CLO2]	04
	c)	Discuss the role of sex determination mechanisms for sex reversal of fish. [L2; CLO2]	03
Q.4	a)	What are the assumptions of Hardy-Weinberg equilibrium equation? [L4; CLO4]	04
	b)	Mention the significance of fixation index (Fst), expected heterozygosity (He) and observed heterozygosity (Ho) in estimating population genetic structure. [L3; CLO4]	03
	c)	How does population structure arise among populations? [L2; CLO3]	03

SECTION-B

There are **FOUR** questions in this section. Answer any **THREE** questions

Q.5	a)	List and define the five foundational terms used by geneticists to describe inheritance and the physical organization of genetic information. [L2; CLO6]	02
	b)	Explain the relationship between a "character" and a "trait" using an example from Mendel's pea experiments. [L4; CLO6]	04
	c)	Identify the three modes of gene action for autosomal genes and state the number of phenotypes produced by each. [L4; CLO6]	04
Q.6	a)	Explain why quantitative differences between individuals are described as a "matter of degree" rather than a "matter of kind." [L1; CLO7]	02
	b)	Define the three sub-components of genetic variance (V_G) and state which one is the primary target of selection programs. [L2; CLO7]	04
	c)	Examine the genetic interaction in common carp scale patterns (S and N genes) and explain why the NN genotype results in death. [L4; CLO7]	04
Q.7	a)	Distinguish between "Broad-Sense Heritability (H^2)" and "Narrow-Sense Heritability (h^2)," explaining which is more useful for breeders. [L4; CLO5]	02
	b)	Explain why sex-specific cut-off values are necessary when breeding species that exhibit sexual dimorphism. [L2; CLO5]	04
	c)	Develop a multi-trait "Selection Index" (I value) formula for a farm prioritizing Growth (70%) and Disease Resistance (30%). [L4; CLO5]	04
Q.8	a)	Define "Effective Breeding Number (Ne)" and provide the formula used to calculate it based on sex ratios. [L1; CLO9]	02
	b)	Correlate the relationship between Ne and the variance of gene frequency change using the Drift Formula. [L2; CLO9]	04
	c)	Evaluate the impact of "Founder Effect" on an island fish population compared to its original mainland source population. [L2; CLO9]	04

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Year: 3rd **Term:** 2nd **Examination year:** 2026 **Session:** 2024-2025

Course code: : 0111 06 Res 3251 **Course Title:** Research Methodology

Total Marks: 60 **Time:** 3.0 hrs **Credit:** 3.0

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SECTION-A

There are **FOUR** questions in this section. Answer any **THREE** questions

Q.1	**a)**	"Research methodology is essential for scientific investigation." – Justify. [L2; CLO1]	**03**
	b)	Discuss the key features of empirical research. [L6; CLO1]	**03**
	c)	Compare exploratory, descriptive, and explanatory research. [L4; CLO1]	**04**
Q.2	**a)**	How many ways can a researcher choose a research topic? Discuss. [L2; CLO3]	**03**
	b)	Describe different types of variables in research. [L2; CLO2]	**03**
	c)	Write the appropriate statistical test names for the following test objectives: (i) compare 2-unpaired groups; (ii) compare 2-paired groups; (iii) compare 3 or more unmatched groups; (iv) predict the value of one variable from another. [L3; CLO2]	**04**
Q.3	**a)**	"Literature review identifies research gaps." Explain the statement. [L4; CLO4]	**03**
	b)	Which criteria are considered for searching literature on a website? [L3; CLO4]	**03**
	c)	Describe the three-phase selection process of the literature review. [L3; CLO4]	**04**
Q.4	**a)**	How many types of research proposal available? Describe them. [L6; CLO5]	**04**
	b)	Outline the key components of the introduction in a research proposal. [L4; CLO5]	**02**
	c)	Describe the different techniques used for identifying and selecting a research problem in fisheries with suitable examples. [L3; CLO3]	**04**

SECTION-B

There are **FOUR** questions in this section. Answer any **THREE** questions

Q.5	**a)**	What are the key features of a research problem? [L2; CLO2]	**02**
	b)	Describe the major steps for formulating a research question. [L2; CLO1]	**04**
	c)	Mention the salient features of a good research question. [L2; CLO3]	**02**
	d)	Briefly explain the 'SMART' framework for crafting research objectives. [L1; CLO2]	**02**
Q.6	**a)**	How does an experiment differ from an observational study? [L3; CLO1]	**02**
	b)	"Proper experimental design improves the precision of research findings". Justify the statement. [L2; CLO2]	**03**
	c)	Briefly describe the major types of experimental designs. [L3; CLO3]	**05**
Q.7	**a)**	What do you mean by sampling method and estimator? [L1; CLO2]	**02**
	b)	Describe the non-probability sampling methods. [L2; CLO1]	**04**
	c)	Explain the characteristics of an ideal sampling design. [L3; CLO3]	**04**
Q.8	**a)**	How will you write a compelling introduction for your thesis? [L4; CLO4]	**04**
	b)	'A clear conclusion convinces the reviewers to judge the quality of your paper, whether it merits publication in the journal'- Justify. [L3; CLO4]	**03**
	c)	Which section will you write first during thesis writing, and why? [L4; CLO4]	**03**