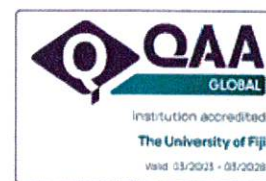




The University of Fiji
(An Entity of Arya Pratinidhi Sabha of Fiji)



SCHOOL OF SCIENCE AND TECHNOLOGY
Semester 1, 2026

FINAL EXAMINATION PAPER

BIO215: INTEGRATED PEST MANAGEMENT

Important Instructions to Students:

1. There are nine (9) pages in this paper. Read the questions, instructions carefully and answer the questions.
2. You are allowed an **extra 10 minutes reading time** (during this time, you are not allowed to write with pen) and **180 minutes (3 Hours) to complete this paper**.
3. Silent, non-programmable calculators are allowed but not supplied.
4. Write all your answers in the answer booklet provided. If you need extra sheets, please ask from the supervisor. Write your name, course code and student identification number in the answer booklet and in the attendance sheet.
5. This paper contains three (3) sections A, B, and C. **In Sections A and B, all questions must be answered. In Section C, four (4) choices are provided, answer any two (2) questions of your choice.**
6. Write all your answers legibly. Ensure that all question numbers are properly written before the answer. The marker has the right to award zero for answers that are not legible.
7. This is a **Closed Book Examination**. The University views plagiarism, cheating and dishonest practice as serious offences and if found, offenders are penalized.

Examination Paper Content (Format):

<u>Section</u>	<u>Question</u>	<u>Content</u>	<u>Marks</u>	<u>Suggested Time</u>
A	1-30	Multiple Choice	30	54 minutes
B	1-5	Short Answer Questions	50	90 minutes
C	1-4	Essay Writing	20	36 minutes
		TOTAL	100	180 Minutes

There are 30 multiple choice questions. **All are compulsory.** Write the letter of the correct answer in your answer booklet.

1. In pest management, microevolution refers to
 - A. Large-scale evolution over millions of years
 - B. Small genetic changes within pest populations over time
 - C. Elimination of genetic variation in pests
 - D. Development of new crop species
2. Which process best explains the development of pesticide resistance in insect populations?
 - A. Random elimination of all susceptible insects
 - B. Natural selection favouring resistant individuals
 - C. Increased rainfall during the cropping season
 - D. Reduction in soil fertility levels
3. What is meant by the Economic Injury Level (EIL)?
 - A. The pest population level at which control measures are applied
 - B. The pest population level at which the cost of damage equals the cost of control
 - C. The highest pest population that can occur in a field
 - D. The lowest detectable pest population
4. Why is *Bt* cotton considered a genetically modified crop?
 - A. It requires repeated pesticide applications to remain effective
 - B. It produces a protein that is toxic to certain insect pests
 - C. It prevents all plant diseases from occurring
 - D. It increases the reproductive rate of insect pests
5. Which of the following organisms is best classified as a predator?
 - A. A parasitic wasp that lays eggs inside a host
 - B. A ladybird beetle that feeds on aphids
 - C. A fungal pathogen that infects insects
 - D. A virus that infects caterpillars
6. How does a parasitoid differ from a predator?
 - A. A parasitoid feeds on many prey individuals during its lifetime
 - B. A parasitoid develops in or on a single host and eventually kills it
 - C. A parasitoid does not depend on a host organism
 - D. A parasitoid feeds only on plant material
7. Which of the following practices is considered a cultural method of pest control?
 - A. The application of chemical pesticides
 - B. The rotation of crops between seasons
 - C. The release of natural enemies into the field
 - D. The manual removal of insects

8. Which of the following is an example of a mechanical method of pest control?
- A. Rotating crops between planting seasons
 - B. Introducing predators into the field
 - C. Using traps or physical barriers to capture or exclude pests
 - D. Applying fertilisers to improve plant health
9. Why does monocropping often lead to increased pest problems?
- A. It increases the diversity of natural enemies
 - B. It reduces the availability of food for pests
 - C. It provides a continuous and uniform food source for pests
 - D. It improves resistance of crops to pests
10. What is meant by inundative augmentation in biological control?
- A. The release of a small number of natural enemies early in the season
 - B. The release of large numbers of natural enemies to achieve immediate pest suppression
 - C. The permanent establishment of exotic natural enemies
 - D. The complete elimination of pests using biological agents
11. What characterises inoculative augmentation in biological control?
- A. The release of natural enemies in very large numbers at once
 - B. The absence of reproduction after release
 - C. The release of small numbers of natural enemies with the expectation that they will reproduce and increase
 - D. The eradication of pests within a short time period
12. What is the main objective of conservation biological control?
- A. To introduce new species into an ecosystem
 - B. To protect and enhance existing populations of natural enemies
 - C. To increase the use of chemical pesticides
 - D. To eliminate all pest species from the field
13. What is meant by pesticide resistance?
- A. An increase in the effectiveness of pesticides over time
 - B. A reduction in pest population size after spraying
 - C. The ability of pests to survive doses of pesticides that previously controlled them
 - D. The complete elimination of pests after repeated applications
14. What is pest resurgence?
- A. A permanent decline in pest populations
 - B. An increase in natural enemy populations
 - C. A rapid increase in pest population following pesticide application
 - D. A reduction in crop damage

15. Which of the following is considered a harmful cultural practice in IPM?
- A. Practising crop rotation
 - B. Maintaining good field sanitation
 - C. Applying excessive nitrogen fertiliser
 - D. Using intercropping systems
16. A farmer observes a low population of aphids on a crop, while a high number of ladybird beetles are present in the field. What is the most appropriate management action?
- A. Apply a broad-spectrum pesticide immediately
 - B. Remove all affected plants from the field
 - C. Continue monitoring the situation without applying pesticides
 - D. Increase fertiliser application
17. A pest population in a crop is increasing rapidly and is expected to cause economic damage if no action is taken. What is the most appropriate course of action?
- A. Take no action and allow natural processes to occur
 - B. Wait until visible damage occurs before acting
 - C. Apply control measures when the economic threshold is reached
 - D. Remove all natural enemies from the field
18. A farmer applies pesticides frequently and later observes that the pest population returns in even greater numbers than before. Which of the following best explains this situation?
- A. Improved resistance of the crop plants
 - B. Pest resurgence due to the destruction of natural enemies
 - C. Increased biodiversity in the field
 - D. Reduced pest reproduction rates
19. A particular soil-borne pest continues to appear in the same field every planting season. Which of the following IPM strategies would be most effective in managing this problem?
- A. Increasing the frequency of pesticide application
 - B. Practising crop rotation with non-host crops
 - C. Increasing irrigation levels
 - D. Removing natural enemies from the soil
20. A biological control agent is released in very large numbers into a crop field, but it does not establish a long-term population. Which type of biological control does this represent?
- A. Classical biological control
 - B. Inoculative augmentation
 - C. Inundative augmentation
 - D. Mechanical control
21. A farmer introduces a natural enemy species with the intention that it will establish permanently and provide long-term pest control. Which approach is being used?
- A. Inundative augmentation
 - B. Classical biological control
 - C. Mechanical control
 - D. Chemical control

22. What is a major consequence of overusing broad-spectrum pesticides in an IPM system?
- A. Increased populations of natural enemies
 - B. Reduced development of pesticide resistance
 - C. Destruction of beneficial organisms
 - D. Improved ecosystem balance
23. Which factor is most important when determining the number of natural enemies to release in an augmentative biological control programme?
- A. The colour of the crop leaves
 - B. The density of the pest population
 - C. The preference of the farmer
 - D. The type of soil in the field
24. Which of the following practices best supports conservation biological control?
- A. Frequent application of chemical pesticides
 - B. Providing suitable habitats for natural enemies
 - C. Removing all non-crop plants from the field
 - D. Increasing fertiliser application
25. Which of the following best describes a mechanical method of pest control?
- A. The use of chemical substances to kill pests
 - B. The use of living organisms to control pests
 - C. The physical removal or exclusion of pests using tools or devices
 - D. The alteration of planting practices
26. Which of the following is an example of a microbial biological control agent?
- A. A ladybird beetle feeding on aphids
 - B. *Bacillus thuringiensis* used to control caterpillars
 - C. A parasitic wasp laying eggs in a host
 - D. A spider capturing insects
27. Which of the following is a possible disadvantage associated with the long-term use of genetically modified crops?
- A. Increased effectiveness of all pesticides
 - B. Development of resistance in pest populations
 - C. Elimination of all insect species from the environment
 - D. Reduced crop productivity in all farming systems
28. Which of the following practices helps to break the life cycle of pests in agricultural systems?
- A. Continuous cropping of the same species
 - B. Crop rotation with non-host plants
 - C. Excessive irrigation
 - D. Application of high levels of fertiliser

29. Why are sampling and monitoring important components of IPM?
- A. They eliminate pests immediately
 - B. They increase pesticide use
 - C. They provide information for informed decision-making
 - D. They replace biological control methods
30. Which of the following statements best describes decision-making in Integrated Pest Management?
- A. Pesticides should always be applied when pests are detected
 - B. Pesticides should be used as the first line of control
 - C. Decisions should be based on monitoring, thresholds, and the integration of multiple control methods
 - D. Natural enemies should be avoided

SECTION B

SHORT ANSWER QUESTIONS

50 MARKS

Answer **ALL FIVE QUESTIONS** in this section. Ensure that all answers are neatly written in your answer booklet. Each question is worth 10 marks.

QUESTION 1

(10 MARKS)

Complete the paragraph below using the words from the list provided. Each word may be used **once only**.

Word List: adaptations, environment, evolution, genes, inherited, natural selection, pesticides, population, reproduce, resistance

Paragraph:

When (i)_____ are applied repeatedly to control insect pests, not all individuals in the pest (ii)_____ are affected in the same way. Some insects may possess favourable (iii)_____ that allow them to survive exposure to the chemical. These characteristics are controlled by (iv)_____ and can be passed from parents to offspring as (v)_____ traits. The surviving insects are more likely to (vi)_____ and produce offspring with similar characteristics. Over time, the process of (vii)_____ increases the number of resistant individuals within the population. As a result, the pest population gradually develops (viii)_____ to the pesticide. This process is an example of microevolution and demonstrates how organisms can change in response to pressures in their (ix)_____ through the process of (x)_____.

QUESTION 2

(10 MARKS)

Indicate whether each of the following statement is **True** or **False** (1 mark each).

- a. IPM aims to completely eliminate all pest species.
- b. Predators consume multiple prey individuals during their lifetime.
- c. Inoculative augmentation relies on the reproduction of natural enemies after release.

- d. Economic threshold is always higher than the economic injury level.
- e. Excessive nitrogen fertiliser can increase pest problems.
- f. Mechanical control methods include traps and barriers.
- g. Pesticide resistance leads to increased effectiveness of pesticides.
- h. Conservation biological control involves protecting existing natural enemies.
- i. Monocropping reduces pest populations over time.
- j. Pest monitoring is unnecessary in IPM systems.

QUESTION 3

(10 MARKS)

Answer **all** questions.

- a. Distinguish between selective pesticides and broad-spectrum pesticides. (2 marks)
- b. Explain why crop rotation is effective in pest management. (2 marks)
- c. State one advantage of biological control over chemical control. (2 marks)
- d. Explain what is meant by pesticide resistance. (2 marks)
- e. State one reason why overuse of pesticides is harmful. (2 marks)

QUESTION 4

(10 MARKS)

The following questions are scenario-based. Read and answer appropriately.

- a. A farmer notices a moderate population of pests but also observes many natural enemies in the field. What is the most appropriate IPM action, and why? (3 marks)
- b. A pest population has reached the economic threshold level. What action should the farmer take at this stage? (2 marks)
- c. A farmer plants the same crop continuously in the same field and experiences increasing pest problems each season. Identify the harmful practice and suggest two suitable IPM solutions. (3 marks)
- d. A biological control agent is released in small numbers early in the season and is expected to reproduce. Identify the type of augmentation and explain its purpose. (2 marks)

QUESTION 5

(10 MARKS)

Answer **both** case study questions.

Case Study 1

A farmer is managing a tomato crop and has noticed an increase in caterpillar damage on the leaves. Upon inspection, the farmer finds that most of the damage is occurring at night. The farmer is considering two options: applying a broad-spectrum insecticide or using a microbial pesticide such as *Bacillus thuringiensis* (*Bt*). The farmer is also aware that there are some beneficial insects present in the field.

- a. Which pest control option would be more suitable in this situation? (1 mark)
- b. Give one reason for your choice. (2 marks)
- c. Identify the type of control method represented by *Bacillus thuringiensis* (*Bt*). (1 mark)
- d. State one advantage of using this method over broad-spectrum insecticides. (1 mark)

Case Study 2

A farmer plants a crop earlier than usual in the season to avoid peak pest periods. As a result, the crop establishes well before major pest populations build up. The farmer observes that pest damage is significantly lower compared to previous seasons, and less pesticide is required.

- a. Identify the IPM strategy used in this scenario. (1 mark)
- b. Explain how this strategy helps reduce pest problems. (2 marks)
- c. Name one other cultural practice that could further reduce pest pressure. (1 mark)
- d. State one benefit of reducing pesticide use in this system. (1 mark)

Answer **ANY TWO QUESTIONS** out of the four in this section in about **250 – 300** words. Write the correct question number in your answer booklet. Each question is worth 10 marks.

QUESTION 1**(10 marks)**

Integrated Pest Management (IPM) relies on the integration of different pest control methods.

- a. Identify and briefly describe four different pest control methods used in IPM. (4 marks)
- b. Explain how combining these methods improves pest management compared to relying on a single method. (4 marks)
- c. State two limitations or challenges associated with implementing IPM. (2 marks)

QUESTION 2**(10 marks)**

Monitoring and decision-making are essential components of IPM.

- a. Explain the importance of pest monitoring in IPM systems. (3 marks)
- b. Distinguish between the economic threshold (ET) and the economic injury level (EIL). (3 marks)
- c. Describe how a farmer would use ET and EIL to decide whether or not to apply control measures. (4 marks)

QUESTION 3**(10 marks)**

Biological control is an important component of sustainable pest management.

- a. Describe the three types of biological control: classical, augmentative, and conservation. (6 marks)
- b. Explain one advantage and one limitation of biological control. (2 marks)
- c. Give one example of a natural enemy and identify the type of biological control it represents. (2 marks)

QUESTION 4**(10 marks)**

A farmer is managing a crop using conventional pesticide-based methods. Over time, the farmer notices that pests are becoming harder to control, beneficial insects are decreasing, and higher pesticide doses are required for the same level of control.

- a. Identify and explain two possible reasons for the reduced effectiveness of pesticides in this situation. (4 marks)
- b. Suggest two IPM-based strategies that could improve pest management in this system. (4 marks)
- c. Explain one environmental benefit of shifting from heavy pesticide use to IPM. (2 marks)

THE END