NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES
DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES SCIENCES

QUALIFICATION : BACHELOR OF SCIENCE IN AGRICULTURE	
QUALIFICATION CODE: 07BAGA	LEVEL: 7
COURSE CODE: ENR721	COURSE NAME: ENVIRONMENTAL AND NATURAL RESOURCE ECONOMICS
DATE: JANUARY 2023	
DURATION: 3 HOURS	MARKS: 100

SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	M LUBINDA
MODERATOR:	S KALUNDU

INSTRUCTIONS
1. Answer ALL the questions.
2. Write clearly and neatly.
3. Number the answers clearly.

PERMISSIBLE MATERIALS

1. Examination question paper
2. Answering book
3. Calculator

THIS QUESTION PAPER CONSISTS OF 4 PAGES (Excluding this front page)

QUESTION ONE [MARKS]

a. With the aid of a diagram, describe the Material Balance Model. (6)

b. Explain the three main objectives of environmental management from a policy perspective. (6)

c. Suppose the market for organically grown maize is modelled through the following market supply and demand functions:

$$P = 25 - 0.025Q$$
$$P = 10 + 0.005Q$$

Where P is the price per kilogram and Q is quantity in thousands of kilograms.

  i. Estimate the minimum selling price, choke price, equilibrium quantity, and equilibrium price. (4)

  ii. Suppose the government wants to introduce a policy that supports the production of organic maize. This policy introduces a mandatory price of N$15 per kilogram. Estimate the welfare effects of the policy. (*Hint: estimate the total surplus before and after the introduction of the policy.*) (9)

Total marks **[25]**

a. Explain the difference between a public good and a private good. (4)

b. Explain why environmental standards are not usually set at an allocative efficient level. (4)

c. Suppose a lather manufacturing company is releasing pollution into a nearby rangeland, and the associated health and ecological damages are not considered in the private market. Suppose you are working for the Department of Environmental Affairs, and you are provided with the following marginal benefits and costs.

$$MPB = 80 - 0.5Q \qquad MPC = 10 + 0.5Q \qquad MEC = 0.4Q$$

Where Q is the quantity in thousands of kilograms of lather and P is the price per kilogram of lather.

   i.   Estimate the quantity and price when the market is in competitive equilibrium. (3)

   ii. Estimate the quantity and price when the market is in efficient equilibrium (5)

   iii. Suppose a community owned the right to the rangeland, and it is negotiating with the lather company that is willing to pay the community to produce more output. For the 40th unit of output, determine range within which a payment would be acceptable to both parties. (9)

TOTAL MARKS **[25]**

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a. Compare and contrast the command-and-control and market approach to environmental management.

(6)

b. Suppose the City of Windhoek is attempting to set a water quality standard, where water quality is measured in percent of heavy metals abated (A), and the marginal social benefit (MSB) and marginal social cost (MSC) of abatement have been estimated as follows:

(6)

$$MSB = 40 - 0.2A \qquad MSC = 0.9A$$

The Department of Environment Affairs sets the standard at 10 percent. Is this standard set efficiently, too stringently, or too leniently? Explain your answer.

c. Suppose there are two power plants that are releasing sulphur dioxide into the air that exceeds the emission standard. To meet the standard, 60 units of sulphur dioxide must be abated in total. The two plants face the following abatement costs:

$$MAC_1 = 0.3A_1 \qquad MAC_2 = 0.9A_2$$

Where costs are measured in thousands of Namibian dollars.

i. Prove that a uniform standard will not meet the cost-effectiveness criterion. Explain your answer.

(6)

ii. Determine how the abatement levels should be reallocated across the two plants to minimize costs.

(7)

TOTAL MARKS **[25]**

a. Explain the instruments that are used under the market approach to manage the environment.

(8)

b. Suppose the Department of Environmental Affairs (DEA) seeks to introduce a voluntary emissions trading program, which allows polluters to achieve cost-effective solutions when meeting clean air requirements in the Environmental Management Act. Suppose that the DEA's objective for two major polluters is a 70 percent reduction in carbon monoxide emissions. Suppose further that the two firms face the following costs:

$$Firm\ 1: TAC_1 = 1000 + 2A_1^2 \qquad MAC_1 = 4A_1$$

$$Firm\ 2: TAC_2 = 500 + 5A_2^2 \qquad MAC_2 = 10A_2$$

Where A_1 and A_2 represents the percentage of carbon monoxide abatement achieved by firm 1 and firm 2, respectively, and TAC and MAC are measured in thousands of Namibian dollars.

i. Calculate the TAC and MAC for each firm if a uniform abatement standard were used.

(5)

ii. Is there an economic incentive for the firms to participate in the trading program. Explain your answer.

(2)

iii. Quantify the cost savings associated with cost-effective abatement allocation that could be achieved through trading.

(6)

iv. At what price must each tradable permit be set to achieve the cost-effective solution.

(4)

TOTAL MARKS [25]

THE END