PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

FORESTRY DEPARTMENT

2024 FIRST SEMESTER EXAMINATIONS

FR 313: PLANTATION SILVICULTURE

TOTAL MARKS: 100 marks

TIME ALLOWED: 3 HOURS

DATE: Tuesday 28th May 2024

Student name: _____ Student ID# _____

INSTRUCTIONS:

1. FILL OUT THE SEPARATE ATTENDANCE FORM PROVIDED BY THE INVIGILATOR
2. WRITE YOUR NAME & DETAILS CLEARLY ON THE ANSWER BOOKLET PROVIDED
3. USE OF CALCULATORS IS ALLOWED!
4. **NO MOBILE PHONES ALLOWED IN THE EXAM ROOM!**
5. THERE ARE **20** MULTIPLE CHOICE QUESTIONS, **11** SHORT ANSWERS, CALCULATIONS & DISCUSSION QUESTIONS. **ANSWER ALL OF THEM!**
6. ALL OTHER PNG UNITECH EXAM RULES ARE APPLIED IN THIS EXAM

Part A: Multiple Choice **(30 marks)**

Instructions: Write down the right answers beside the question numbers in your answer booklet. Each question is 1.5 marks.

Question 1: Why is it important to plan for plantation development?

A *It is a long term investment*
B. *Security of the plantation*
C. *Accessibility*
D. *All of the above*

Question 2. What is a clonal seed orchard?

A. *A seed orchard raised from seeds*
B. *A seed orchard raised from vegetative means*
C. *A fruit tree farm?*
D. *All of the above*

Question 3: What is the term given to a seed which develops an embryo without the process of fertilization?

A *Apomixis*
B *Chimeras*
C. *Clone*
D. *Polyembryo*

Question 4: Planting programs depends very much on the availability of seeds. In PNG, most plantation projects by PNG Forest Authority, tree farmers and reforestation companies sourced seeds from:

A. *Seeds imported from overseas seed dealers*
B. *National Tree Seed Centre*
C. *Wildings (seedlings collected from forest floor)*
D. *All of the above*

Question 5: Enrichment planting is good in a sense that,

A. Establishment cost is reduced easy undertakings of silvicultural treatments
B. Fast growth rates with long rotation ages
C. Low establishment cost and reduced site disturbances
D. All of the above

Question 6: What are the site specifics to consider when selecting site for planting?

A *Accessible topography*
B. *Sufficient rainfall*
C. *No frost*
D. *All of the above*

Question 7: Which of the following statements is TRUE about survival and mortality of seedlings and trees

A. *High survival rate results in High Mortality rate of the same batch of seedlings or trees*
B. *Survival rate is the same as mortality rate*
C. *Survival rate equals 100% minus the mortality rate*
D. *Mortality rate equals number of dead seedlings divided by the number of surviving seedlings or trees multiplied by 100%*

Question 8: You planted 460 seedlings in a hectare of land. After one year, your assessment indicates that 45 seedlings have died, what is your survival and mortality rate of the planting?

A *Survival = 0.902% and mortality = 9.78%*
B *Survival = 9.78% and mortality = 90.23%*
C. *Survival = 9.02% and mortality = 97.8%*
D. *Survival = 90.2% and mortality = 9.78%*

Question 9: The main purpose of maintaining lower mortality rate in a commercial tree plantation operation is;

A *Achieve high stock or volume*
B *Avoid extra cost of establishment*
C *Achieve a healthy plantation stock*
D. *Both A & B*

Question 10: What are the 4 sources of stress that can reduce survival and increase mortality in seedlings and trees?

A *Unfavourable climatic conditions, sufficient soil nutrient, mechanical injury and attack by pest and diseases*
B *Harsh climatic conditions, soil nutrient deficiency, induce injury by mechanical means and high pest and disease attack*
C. *Lack of soil nutrients, favourable climatic conditions, attack by pest and diseases and injury by mechanical means.*
D. *Both A & B*

Question 11: Which silvicultural activities are done in Tree plantation RELEASE operations?

A. *Cleaning and pruning*
B. *Salvage and pruning*
C. *Tending (weeding) and Tending*
D. *Salvage and sanitation cuttings*

Question 12: How many seedlings would you plant in a hectare of land if you are planting at 5m X 5m regular spacing?

a) *500*
b) *625*
c) *25*
d) *400*
e) *None of the above*

Question 13: We discussed in class that the younger the tree, the closer you can apply fertiliser by placing in holes not less than 10cm to the stem of the young seedling, the older the tree, the further away you apply fertiliser. Why do you apply fertiliser close to younger trees as compared to older trees?

a) *To prevent fertiliser burning stems of young trees/seedlings*
b) *To prevent overdose of fertiliser to older plants*
c) *Older plants have more longer spread of rooting system away from their stem*
d) *None of the above*

Question 14: Plantations differ from natural forest in a view that;

a) *Plantations are more valuable*
b) *Plantations do no offer much environmental and ecosystem services*
c) *Plantations are orderly and uniform*
d) *Plantation management is more costly*

Question 15: A progeny's selected phenotypic qualities will be

a) *Same as the parent tree (s)*
b) *More improved than the parent tree (s)*
c) *Similar to the progeny's sibling grown in the same locality*
d) *Both b & c*

Question 16: An allele is one of two or more versions of a gene. Each individual has two alleles of each gene, one from each parent. Mutant alleles in the genes of a plant will result in,

a) *Heterogeneous qualities of the individual plant from the population*
b) *Homogenous qualities of the individual plant from the population*
c) *A dormant genes*
d) *Both a & c*

Question 17: Mass selection is one of the method of selection for candidate trees. This method is used when;

a) *The tree's genetic attributes are known*
b) *The tree's phenotypic traits are unknown*
c) *When the tree's parents are unknown*
d) *All of the above*

Question 18: A plot of an existing plantation managed as a Seed Production Area that is raised from seeds of elite trees of a known progeny is a;

a) *Seedling seed orchard*
b) *Clonal seed orchard*
c) *A seed provenance*
d) *None of the above*

Question 19: How can we reduce loss of seed viability when storing seeds?

a) *Keeping high moisture content, low temperature and low Oxygen*
b) *Keeping low moisture content, low temperature and high Oxygen*
c) *Keeping high humidity, high temperature and low oxygen*
d) *Keeping low moisture content, low temperature and low oxygen*

Question 20: In crown position classification of tree categories, one of the sub class is called wolf trees. What do they mean by wolf trees?

a) A tree that has a crown shaped like a wolf
b) A tree that is stands like wolf with propped roots
c) A tree that grows so well and bits every other trees with wide and coarse branching that it becomes undesirable.
d) None of the above

Part B: Short Answers **(40 marks)**

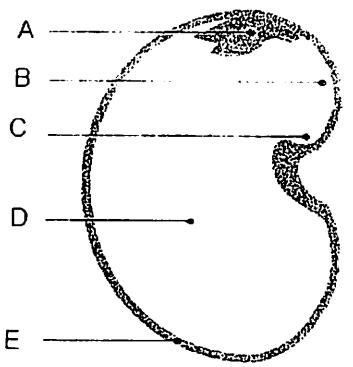
Instructions: Write your answers on the answer sheet.

Question 21: What are the two types of mechanical thinning that can be applied to Tree plantations? **(2marks)**

Question 22 State the four major stages of tree improvement process. **(4 marks)**

Question 23: Briefly explain the four stages of even aged forest stand development **(8 marks)**

Question 24: Name the different parts (A, B, C, D and E) of the seed and state if the seed below is a monocot or a dicot? **(6 marks)**



Question 25: Explain the reasons as to why shade tolerant species must undergo less intensity of thinning compared to light demanding species? **(6 marks)**

Question 26: In considering tree plantation establishments, why is it important to consider versatility of the species to supply diversified end product markets when the trees are matured rather than a species that can only supply one specific end product market? **(4 marks)**

Question 27: Define the following Silviculture treatments and state their main purpose in facilitation plantation management and tree improvement objectives; **(6 marks)**

i) *Sanitation cut in tree stand improvement*
ii) *Pruning in wood quality improvement*

Question 28: What is the role of green breaks and conservation areas in design and mapping of a forest plantation plan? **(4 marks)**

Part C: Calculations **(20 marks)**

Instructions: Show calculations on your answer sheets and write down the answers with correct units

Question 29: You have done a boundary survey of a block of land to establish your tree plantation. You draw up your map on a *scale of **1cm: 20m***

a) Calculate the area in hectares of the block if you are using a 10mm^2 dot grid and counted a total of 3400 dots in your map? **(6 marks)**
b) If you're going to plant your trees at 3m by 3m spacing, how many trees are you going to need to plant the area? **(6 marks)**
c) If you are expecting 15% mortality post establishment, how many extra seedlings are you going to raise? **(3 marks)**

Question 30: Assume your plantation area in question 30 needs Nitrogen supplements at rate of 60 kg N/ha to boost plant growth and Sulphur to lower soil PH. *The fertilizer Amonium Sulfate you are recommended to use has 21 % Nitrogen and 24 % Sulfur;*

a) Calculate the rate of application for Ammonium Sulfate per hectare **(3 marks)**
b) How much nitrogen are you adding per tree in the process of applying Nitrogen? **(2marks)**

Part D: Discussions **(10 marks)**

Instruction: Write half a page discussion for question 31 in your answer sheet

Question 31: Write a half page discussion on stand density improvement in particular the principles of thinning. In you write discussions, define what Thinning is and how it affects stand density. Also state generally how trees can be categorized to undertake thinning **(10 marks)**