# THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY SCHOOL OF FORESTRY TARAKA CAMPUS

## FR 413: FOREST ENGINEERING & TIMBER HARVESTING

## SEMESTER ONE (1) EXAMINATION / 2024

## **INFORMATION TO CANDIDATES:**

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DATE OF EXAMINATION:	27 <sup>th</sup> May 2024
TIME EXAMINATION STARTS:	8:20 am
TIME EXAMINATION FINISHES:	11:20 am
TIME ALLOWED:	3 Hours
VENUE:	School of Forestry Biology Laboratory
TOTAL SCORE:	150 Marks
NO. OF CANDIDATES:	40

THIS EXAM WILL CONTRIBUTE 50% TOWARDS YOUR FINAL ASSESSMENT.

## INSTRUCTIONS:

- 1. Write down your name and Student number clearly on the answer sheet and Attendance slip. Do it now.
- 2. You have 10 minutes to read through the exam paper.
- Write all your answers in the separate examination book provided.
- 4. You are to attempt all questions in this exam.
- 5. Value of each question is indicated by the mark beside it.
- Turn off all cell phones now; it cannot be used as a calculator.

#### PART A

## Write as TRUE or FALSE

Juestion 1

Mechanics of materials deals with mechanical principles relating to bodies in motion.

#### Question 2

Careful attention has to be paid, when planning and locating roads in steep terrain, to avoiding and minimizing the erosional impact of roads on the environment.

# Question 3

The standard of a road depends largely on its proposed end use, on the amount of harvestable and marketable wood per unit area as well as on terrain conditions.

#### Question 4

Feeder roads are used only for harvesting and post harvesting period and are abandoned within 3 years of construction.

#### Question 5

Base Course (Base): This is the secondary load-spreading layer underlying the base. It normally consists of a material that has lower strength and durability than that used in the base, e.g. unprocessed natural gravel, gravel/sand or gravel/sand/clay.

#### Question 6

In all cases, the goals of geometric design are to maximize the comfort, safety, and economy of facilities, while minimizing their environmental impacts.

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#### Question 7

Design speed. Design speed is the single most important factor that affects the geometric design. It directly affects the sight distance, horizontal curve, and the length of vertical curves.

## Question 8

The roads can be classified in many ways. The classification based on speed and accessibility is the most generic one.

## Question 9

Bulking factor is a factor, used in earthwork design, to increase (or bulk) the volume of Bulking factor is a factor, used in curtificant costign, to interest (or cost) and reaction of cut material to embankment to make allowance for losses and consolidation in the transformation of cut material to fill embankments in road construction.

## Question 10

Log culverts for streams must be designed to pass the 100-year return peak discharge.

## Question 11

Road construction costs may vary considerably depending mainly on the terrain and soil conditions, road standards, machine and Labour costs, etc., as well as on the skill of operators and labourers road star nvolved.

## Question 12

Question 12 The characteristics of soil grains depend upon the size, shape, texture, chemical composition and The characteristics of soil grains depend upon the size, shape, texture, chemical composition and electrical charges on the surface of fine soil particles.

Compaction of the subgrade and surface through the use of equipment designed for this purpose will increase the load carrying capacity of the roadbed and reduce the volume of surfacing material hat will be required to maintain the roadbed during its service life.

## astion 14

te bearing power of subgrade soil varies with the amount of water present in it, being the lowest when it is saturated with water.

## Question 15

A bridge is built over a body of water that is large and has variable flow. A culvert is constructed when water needs to be conveyed through tunnels or channels under a roadway.

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## PART B: SHORT ASNWERS Answer all Questions. Each question is worth the marks written beside

#### TOTAL MARKS: 60

(6 Marks) Question 1 For a road project to be successful, each step of the road management process must be performed. List down these steps? (3 Marks) Question 2 What is a Low Volume Road? (6 Marks) Question 3 List down the factors that influence the Road construction costs. .. (2+2+2= 6 Marks) Question 4 List down the 3 Elements of design that are included or considered in the Road Survey, Design, and Construction stage? (4 Marks) Question 5 What is Precipitation or define the term precipitation? (4 marks) Question 6 List down the four main particles identified in soils. (4 Marks) Question 7 List down the three important phases of the hydrologic cycle (4 Marks) Question 8 Transport network reliability is important and defined as? (1+1+1= 3 Marks) Question 9 How should we build a forest road network? List down the 3 important questions that we must consider/answer when planning for a forest road network system. (4 Marks) Question 10 Water can be stored in any one of the following major reservoirs; List down 4 major reservoirs? (4 Marks) Question 11 Why does the Sight distance play an important role in geometric highway design? (4 Marks) Question 12 Stopping sight distance is defined as? (4 Marks) Question 13 Transportation corridors are key component of transport infrastructure therefore, what are these corridors considered as?

Ouestion 14 (4 Marks) Road Management Objectives (RMOs) help define and document the road purpose, list down 4 main objectives?

PART C: SHORT ASNWERS Answer all Questions Each question is worth the marks written beside it.

## TIMBER HARVESTING TOTAL MARKS: 75

Define/Explain the following terms: 1

(2+2+2+2+2+= 10 Marks)

- A. Directional felling. B. Water bars
- C. Buffers Zones

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- D. Forest Industry Participant
- E. Selection logging
- 2. Briefly explain the 3 levels of planning for Timber Permit holders conducting timber harvest in forest concession under the Forest Management Agreement in Papua New Guinea. (15 Marks)
- 3. The holders of Timber Permit conducting timber harvest are allocated "Annual Allowable Cut" for the herm of the FMA concession? What is the whole purpose of AAC? (5 Marks)
- (4) List 5 field prerequisite activities of preparing a Set-up prior to inspection and approval for logging.
- 5. What is the objective of implementing the "PNG Logging Code of Practice"? (5 Marks)
- 6. List and explain in sequence the five major timber harvest activities which uses machineries to harmoniously complete the harvest operation. (10 Marks)
- 7. List at least five items for decommissioning, before certification of close-up of the Set-up is issued. (5 Marks)
- 8. What does planning, monitoring and control mean in timber harvesting? (10 Marks)
- List five negative impacts of logging that may occur if there is inconsistency in monitoring and control 9 process. (5 Marks)
- 10. Calculate the net area of forest required for formulating an Annual Logging Plan based on the allocated AAC of 60,000 m A pre-harvest inventory of the timber resource conducted and analysed established that there are 30 m3/ha of merchantable volume. (5 Marks)

Good Luck