

**MAASAI MARA UNIVERSITY**

**REGULAR UNIVERSITY EXAMINATIONS 2016/2017 ACADEMIC YEAR**

**THIRD YEAR FIRST SEMESTER**

**SCHOOL OF TOURISM AND NATURAL RESOURCE MANAGEMENT**

**BACHELOR OF SCIENCE IN ENVIRONMENTAL STUDIES**

**COURSE CODE: FOR 324**

**COURSE TITLE: FOREST ENGINEERING**

**DATE: 6TH JULY, 2017 TIME: 1100 – 1300HRS**

**INSTRUCTIONS TO CANDIDATES**

Answer **ALL** questions in section **A** and any other **THREE** in section **B.**

***This paper consists of 4 printed pages. Please turn over.***

**Section A: Answer ALL questions in this section**

1. (a) Who is a forest engineer **(1 mark)**

(b) State four roles of a forest engineer **(2 marks)**

2. Define gears **(1 mark)**

3. Calculate the velocity ratio of a bicycle with a 60 teeth pedal gear and 30 teeth sprocket gear. Explain the meaning of your final answer (**4 marks)**

4. A Dunker diagram is often used to provide solutions to engineering problems. Explain the two sides of a Dunker diagram. **(2 marks)**

5. State two mechanical properties of both wood and steel as engineering materials **(4 marks)**

6. Define the following terms as used in mechanics by giving the appropriate SI units **(4 marks)**

1. Work
2. Power
3. Torque
4. Speed

7. Explain the meaning of the term ‘safety’ as applied in forestry operations                                                                                                **(2 marks)**

8. Describe uses of the following machinery and/or equipment commonly used in forestry operations **(4 marks)**

1. Feller-buncher
2. Yarder
3. Excavator
4. Front end roller

9. Poorly planned harvest operations can have adverse environmental impacts. Identify and briefly describe three potential impacts **(3 marks)**

**Section B: Answer ANY THREE questions from this section. All questions in this section carry equal marks.**

Q9. (a) State any five factors that affect the choice of forestry equipment

               and machinery **(5 marks)**

1. Complete the following machine rate calculation form      **(10 marks)**

**Assumptions**

P = Purchase Price ($) = 300,000 F = Fuel and Lube ($/PMH) = $22

S = Salvage Value ($) = 45,000 T= Tires & Tracks ($/PMH) =$18

L = Life in years = 8 R = Repair & Mainte (% of DPR) = 110%

H = SMH/year = 2,200 LR = Labor rate ($/SMH) = 21

I = Inter, taxes & Insur = 12% LF = Labor fringe (% of LR) = 45

U = Utilization (%) = 70

A = Average Fixed Investment = ((P-S) x (L+I)/(2 x l) + S =\_\_\_\_\_\_\_\_\_\_\_\_\_

**Fixed Costs**

DPR = Depreciation = (P-S)/(LxH) =\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ITI = Int, Taxes and Insur. = (1 x A)/H = \_\_\_\_\_\_\_\_\_\_\_\_

**Total Fixed Cost ($/SMH**)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Variable Costs**

F = Fuel and Lube ($/PMH) =

T = Tyres and tracks ($/PMH) =

RM = Repair and Maintenance = (DPR x R) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Total Variable Cost ($/PMH) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_( x U)

**Total Variable Cost ($/SMH)** = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Labor Costs**

LR = Labor Cost =

LFR = Labor Fringe Cost = LR x LF =

**Total Labor Cost ($/SMH**) =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Total Machine rate ($/SMH)**=\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10. (a) Explain the meaning of the term ergonomics in forestry **(2 marks)**

(b) Explain how poor remuneration of forestry workers would contribute to low productivity **(5 marks)**

(c) Identify and discuss methods that a supervisor can use to induce workgroups to be more effective **(8 marks)**

11. (a) A team of forest engineers is required to design and build a bridge to allow people to traverse the forest compartment. Briefly outline the complete engineering design process they are likely to follow and briefly describe each stage **(7.5 marks)**

(b) Use fishbone diagram to identify all the causes of a forestry machine’s engine NOT starting during ignition process **(7.5 marks)**

12. (a) Name the main components of internal combustion engine **(4 marks)**

(b) Differentiate between spark ignition and compression ignition as different kinds of combustion engines (**4 marks)**

(c) State the role of gears as applied in mechanics (**4 marks)**

(e) Name any three types of gears **(3 marks)**

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