

Professional Foresters Registration Examination April 8, 2016

PART I

Instructions: **APPLICANTS, PLEASE READ THESE INSTRUCTIONS CAREFULLY.**
You **MAY** complete PART I by doing **ONE** of the following two options:

A) Complete the Short Answer Section (Question 1) and Any Two (2) of the Essay Questions (Questions II through V)

Answer Question 1 on these pages, tear from the booklet and submit with the answer packet if you chose Option A for Part I of this examination.

Question II - Forest Mensuration
Question III - Forest Ecology
Question IV-Silviculture
Question V - Forest Protection

OR

B) Complete Any Three of the Essay Questions (Questions II through V) and OMIT answering the Short Answer Question (Question I).

Question II - Forest Mensuration
Question III - Forest Ecology
Question IV-Silviculture
Question V - Forest Protection

Professional Foresters Registration
1416 9th Street, Room 1506-16
Sacramento, CA 95814

ACRONYMS AND ABBREVIATIONS USED IN THIS EXAMINATION

The following Acronyms and/or Abbreviations **may be used** in this examination. Technical abbreviations that should be known by a forester are NOT included here (e.g. DBH, MAI, MBF). You may remove this page for reference throughout this examination. **It need not be returned.**

<u>Acronym or Abbreviation</u>	<u>Full Text</u>
BLM	Bureau of Land Management, USDI
BOF	California State Board of Forestry and Fire Protection
CCR	California Code of Regulations
CAL FIRE, CDFFP	California Dept. of Forestry and Fire Protection
CDF&W	California Department of Fish and Wildlife
FPR	California Forest Practice Rules
PRC	California Public Resources Code
RPF	California Registered Professional Forester
THP	California Timber Harvest Plan
TPZ	California Timber Production Zone
USFS	United States Forest Service, USDA

Answer on these pages, tear from the booklet and submit with the answer packet if you chose Option A for Part I of this examination.

**APRIL 2016 RPF EXAMINATION QUESTION I -
SHORT ANSWERS**

3% 1. The process by which a landscape is broken into small islands of forest within a mosaic of other forms of land use or ownership is known as:

3% 2. An **Ecosystem** can generally be defined as:

3% 3. The total assimilation of energy and nutrients per unit of time by an organism or a plant community is called _____ production.

3% 4. Describe the difference between litter and humus.

2% 5. The term used to describe the actual volume of lumber sawn in excess of the lesser estimated scaled log volume is:

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3% 6. In economic terms, the actual quantity of a commodity or service that buyers are willing to purchase in the market at a given price over a specified time period is called:

3% 7. Define the term **marginal revenue**.

2% 8. The distance from a landing to the farthest point in the cutting unit is called the

3% 9. You are standing on point A and looking upslope to point B. Point B is 220 ft, slope distance from you, and your instrument shows the slope is +22%. How much higher is point B than point A?

3% 10. In California, name the three Cadastral Survey Base and Meridian Systems used to facilitate and organize the Public Land Survey System in the state.

3% 11. List **three (3)** factors that have led to the increasing use of the Cut-to-Length harvester over the human system of timber faller and buckler with a chain saw in the U.S. Briefly explain the importance of each factor.

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4% 12. List **two (2)** situations which may occur during field variable plot cruising when is it important to know the plot radius factor.

3% 13. A scale of 1: 6,000 translates to how many feet on the ground per inch on a map?

3% 14. The volume, basal area, or number of trees in a stand that were smaller than a prescribed minimum diameter or height limit at the beginning of any measurement period, and that, during that period, attain the prescribed size is called:

4% 15. What is the difference between a stand's arithmetic mean diameter and its quadratic mean diameter?

4% 16. List **four (4)** types of defects that will result in diameter, volume or length deductions by a scaler.

3% 17. As used in the FPRs, what is meant by the term "Properly Functioning Salmonid Habitat"? _____

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3% 18. In forest fires and other larger public emergencies within the US, a particular organizational system is used to manage the facilities, personnel, participating organizations, equipment and other resources and needs of the emergency. Name this organizational system. (Do not abbreviate)

4% 19. List **four (4)** silvicultural, biological or ecological **preventive** approaches to control forest insects, mites and diseases.

4% 20. Name **four (4)** important social issues that are impediments to increased use of prescribed burning.

3% 21. Under the Forest Practice Act regulations, list **three (3)** characteristics which **define** a "Nonindustrial" tree farmer. _____

3% 22. In terms of water quality law, define the term TMDL and from what law (s) does it derive?

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3% 23. The California Board of Forestry and Fire Protection is appointed by the Governor. The California Public Resources Code states one basis upon which **all the members** of this Board are selected. Briefly describe the basis.

4% 24. Consider two California commercial conifer stands, both similar in most respects (site, topography, species, successful planting origin, mortality from fire and pest effects, etc.), and both approaching typical rotation age. One stand was thinned from below 35 years ago (biomass) and 15 years ago (commercial thin). The other stand had no intermediate treatments. Which stand will have the **greater standing cubic volume** of wood?

3% 25. According to the FPR, which silvicultural method is used to develop an uneven-aged stand from a stand that currently has an unbalanced, irregular or even-aged structure? This method is used no more than twice to increase stocking and improve the balance of age classes so as to allow the residual stand to be managed by selection or group selection.

3% 26. List **three (3)** of the genera *Fagaceae* found in North America.

2% 27. In a forest stand, the tree crown class that forms the general level of the forest canopy and receives full light from above, but comparatively little light from the sides is:

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3% 28. As used in silviculture, what is usually meant by a shade intolerant species? Include a common example of a tree species that is intolerant.

3% 29. As the RPF retained by the plan submitter to provide professional advice throughout timber operations, you discover a previously unreported potentially significant historic archaeological site. According to the FPR's list your responsibilities in this matter.

3% 30. Under the CA Forest Practice Rules, under what conditions would a cable road need to have erosion control measures specified in the THP and installed?

3% 31. Briefly describe what is meant by the term "**adaptive management**" as it applies to forest management.

4% 32. 16. List **four (4)** environmental or topographic settings that are common locations of prehistoric archeological resources found on California timberlands.

(END OF QUESTION)

QUESTION II FOREST MENSURATION

OBJECTIVE

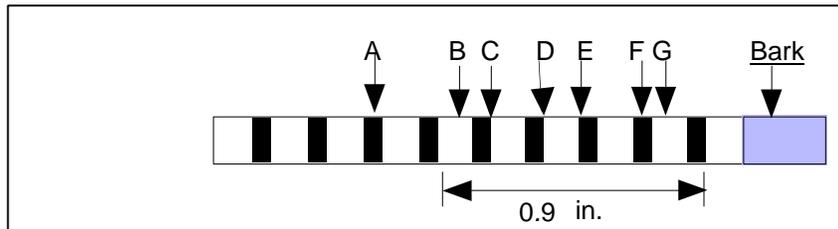
To demonstrate your knowledge of growth calculation and projection.

SITUATION

Your client inherits 160 acres of **Site II**, young growth forest. **Ten years previously**, the client's father partially harvested 30 percent of the stand volume, obtaining most of the volume from trees 30-50 inches dbh. **Five years later**, he had a 10 percent cruise performed on the property. The cruise showed a total gross volume of 2,400 mbf and a total net volume of 2,040 mbf. The father's intent was to develop a sustained yield management plan, but due to illness, his plans never progressed beyond the cruise. The client (his son) calls and wants you to continue to prepare the management plan. You explain that you will have to bore some trees to obtain growth information. You meet on-site with the landowner.

QUESTIONS

Using your increment borer, you bore a 17.8" dbh tree and extract the core shown illustrated below.



- 10% 1. How many years growth does the increment core represent?
- 15% 2. Referring to the increment core:
 - 5% a. Which letter(s) correspond to "spring" wood?
 - 5% b. Which letter(s) correspond to "summer" wood?
 - 5% c. Between what two letters is one year's total growth
- 5% 3. What is the 5-year **diameter** increment of the tree?
- 5% 4. When making future growth projections from increment cores, what is the basic assumption made about past growth, relative to future growth?
- 5% 5. The client asks the age of a 40 inch dbh tree. Your borer is only 10 inches long. What other method could you use to give your client a reasonable response?
- 5% 6. What is the expected dbh of this tree in ten years?

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QUESTION II FOREST MENSURATION PAGE 2

5% 7. Rounding all tree diameters to 2 inch dbh classes, and using the local volume table below, what is the annual percentage growth of this tree?

DBH	Tree Volume (Bd Ft)
14	100
16	200
18	290
20	340
22	460
24	580

5% 8. Does this percentage indicate a simple or compound growth rate?

After taking increment cores from 49 additional representative trees, you determine that the average annual stand growth is actually 4.8 percent of the net volume. You want to use this data to establish an allowable harvest equal to current stand growth (PAI = periodic annual increment).

10% 9. Based on PAI, what is the **total property** annual net volume growth?

10% 10. What was the average annual **per acre** net growth over the past 10 years?

5% 11. At what per cent of maximum sustained production is the current stand growing?

Site	Max. Sustained Production PAI (bf/acre/year)
I	1100
II	850
III	600
IV	300
V	100

10% 12. Assuming the same annual growth rate of 4.8 percent:

5% a. What is the minimum volume per acre inventory required to achieve maximum sustained production?

5% b. On a per acre basis, how much will the present stand have to grow to achieve maximum sustained production?

The landowner needs to generate a small amount of income in the next decade, but still wants his timber stand to ultimately achieve maximum sustained production.

5% 13. If he cuts 500,000 bf **five years from now**, will the time to achieve maximum sustained production be increased or decreased?

5% 14. What is the simplest way to increase standing inventory while still generating some timber revenue?

(END OF QUESTION)

QUESTION III-FOREST ECOLOGY**OBJECTIVE:**

Fisheries considerations have been at the forefront of Forest Practice Regulations in California since 1997 after the Federal Endangered Species Act listing of Coho in 1996. An understanding of 1) stream and riparian habitat, 2) salmonid and other fish requirements and 3) the inter-relationships between these items has become an important part of a forester's knowledge base. The following questions are intended to determine your understanding of stream habitat and salmonids.

QUESTIONS:

- 25% 1. Many of the functional and structural attributes of stream habitat are created and maintained through interaction with riparian vegetation. Riparian areas constitute the interface between terrestrial and aquatic ecosystems, performing a number of functions that affect the quality of salmonid habitat. List **FIVE (5) IMPORTANT** ways riparian areas influence streams and consequently salmonid habitat. **For each way** you have listed, **briefly explain** how the stream habitat is influenced to the benefit of salmonids.
2. Pool to riffle ratios are one parameter which defines a stream's ability to support fish, especially salmonids.
- 5% A) Explain what is meant by pool to riffle ratio and how it is measured.
- 20% B) Define a favorable range of pool to riffle ratio for a Class I stream with salmonids using it. Explain why you think that your specified pool to riffle ratio (or range of values) is favorable to salmonids.
3. The National Marine Fisheries Service (NMFS) in its "1997 Aquatic Properly Functioning Condition Matrix" uses two definitions in describing salmonid ecosystems: "**properly functioning** conditions" and "**fully functioning** conditions".
- 15% A) What is the **difference** between the two terms?
- 10% B) Describe **one (1)** problem in implementing the NMFS concept.
- 25% 4. Large Woody Debris (LWD) has been determined to be very important for salmonid habitat. List and briefly describe **five (5)** effects of insufficient or reduced LWD in a stream.

END OF QUESTION

QUESTION IV FOREST SILVICULTURE**OBJECTIVE:**

Demonstrate your understanding of variable retention management.

SITUATION:

As a California RPF you have been assigned to develop a plan for forest technicians to implement **Variable Retention (VR)** silviculture prescriptions within a 10,000 acre planning watershed owned by your company. The selected stands are a group of ~70 year old naturally regenerated ~80 acre stands on site II ground. The stands were harvested by commercial free thinning ~ 20 years ago. Recent data shows each to be a healthy irregularly stocked conifer and hardwood species stand. However, there is considerable density variability among stands with some poorly stocked acres. Each stand also contains an older canopy of scattered individual and small groups of residual predominant trees.

Your company always practices even-aged variable retention management with intermediate treatments and utilizes all forms of regeneration when appropriate. The company is committed to increasing long term sustained yield (**LTSY**) over time and intends to eventually develop a regular annual flow of timber from this watershed. Your company prefers to not request exceptions to the standard silviculture rules.

QUESTIONS:

10% 1.a. Per FPRs, describe the general approach of "**Variable Retention**" silviculture.

15% 1.b. Per the FPRs, briefly discuss the **major variables** in the variable retention harvest system.

15% 1.c. Per the FPRs, what must the RPF describe in sufficient detail about these major variables to provide for review and evaluation?

2. In general, how would a RPF in California apply Variable Retention silviculture within your planning watershed to achieve the following company goals?

10% 2.a. In order to **increase** long term sustained yield (**LTSY**) over time?

10% 2.b. In order to develop a **regular annual flow of timber** from this watershed?

10% 3. Describe the impacts of implementing the Variable Retention prescription on timber growth and yield at the watershed scale.

5% 4. Per the FPRs, describe the general relationship in Variable Retention silviculture between minimum retention requirements and maximum size harvest area.

5% 5. Per the FPRs, without requesting an exception, how long must retention trees be retained?

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QUESTION IV FOREST SILVICULTURE PAGE 2

20% 6. Answer **either** 6.a: Aggregate VR **OR** 6.b: Dispersed VR. **Do Not answer both!**

6 .a. Write an unambiguous structured tree marking guide for **Aggregate VR regeneration** of your company's typical 80 acre stands with **class II** watercourses. **Explain** your rules.

OR

6. b. Write an unambiguous structured tree marking guide for **Dispersed VR regeneration** of your company's typical 80 acre stands with only **class III** watercourses where the EHR is Low and the slopes are less than 30%. **Explain** your rules.

(END OF QUESTION)

QUESTION V- FOREST PROTECTION

OBJECTIVE

To determine your knowledge and ability to analyze fire potential and develop methods to reduce wildland fire threats with minimal impact upon the environment.

SITUATION

A developer has retained you to prepare a fuels management plan for a new development comprising 475 homes. The project encompasses 1,650 acres of which 425 acres are to be developed over a period of five years. The remaining lands are to be retained in open space and become the responsibility of the homeowners association. The project lies in an area known to have had severe fire activity in the past. The local fire department has expressed concerns that due to the hilly terrain and fuel loading, that strategic wildfire pre-planning will be needed to protect the new development. It has thus required that a fuels management plan be developed and implemented prior to approval of the project.

QUESTIONS

35% 1) Identify **five (5) commonly used methods** of managing and modifying fuels. Briefly discuss the methods, limits and advantages, positive and negative attributes, effect upon the environment and any precautionary considerations such as risk and liability that you feel should be noted. You may use a matrix to facilitate your answer.

45% 2. **In outline form**, describe the steps you would take to develop a fuels management plan that will substantially reduce wildland fire hazards. Include in your plan Public Resource Code requirements for structure fire clearance.

20% 3. **Discuss four (4) alternatives** for the developer to take when a portion of the project lies within an identified extreme fire hazard severity zone and no environmentally sound or cost effective method of mitigating the fuel hazard is available.

(END OF QUESTION)

Professional Foresters Registration Examination April 8, 2016

Part II

**Applicant Must Also Answer Three of the Remaining Five
Essay Questions in Part II**

- Question VI-Forest Engineering
- Question VII-Economics
- Question VIII-Forest Administration
- Question IX-Forest Policy
- Question X-Forest Management

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QUESTION VI-FOREST ENGINEERING**OBJECTIVE**

To determine the applicant's knowledge of harvesting equipment selection and basic harvesting system concepts.

SITUATION

Each harvest unit has a set of management objectives that likely include aspects of safety, profitability, residual stand structure and composition, water quality, legal, social and regulatory concerns. If the equipment and system chosen for a unit are mismatched to the site and stand conditions, then it may be impossible to achieve any or all of these objectives. The ramifications of improper equipment selection may range from unsafe working conditions to unacceptable costs to violations under the forest practice regulations. Making sound choices aims to reduce the risk of those events happening.

QUESTIONS:

50% 1. Using the following list of seven factors (A-G) that would affect harvesting equipment selection listed below, **discuss any five (5)** of these factors as to how the factor being discussed might influence the attainment of the following management objectives (if applicable): **safety, profitability, forest health, water quality**, and other **environmental concerns**.

- A. Terrain Characteristics
- B. Soil Characteristics
- C. Timber Characteristics
- D. Business Requirements
- E. Weather and Climate
- F. Silvicultural Requirements
- G. Legislation, Regulations and THP Requirements

*NOTE: **For the next question**, graph paper is provided, (You must hand this graph paper in with other answer sheets for this Forest Engineering Question. Be sure to hand it in with your Applicant's Number filled-in.)*

25% 2. For a skidder or tractor logging system, graph the general relationship between the cost of roads and the cost of skidding as road spacing changes.

- A) Plot and label the general trend in **skidding cost per MBF** harvested as road spacing increases. Place the cost per MBF on the Y-axis of the graph.
- B) Also, plot and label the general trend in the **cost of roads per MBF** harvested as road spacing changes. Place the road spacing on the X-axis of the graph.

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QUESTION VI-FOREST ENGINEERING PAGE 2

C) On your graph, **plot the total cost per MBF of roads and skidding**. Mark the most economical or optimal road spacing (ERS). Briefly explain how you would use the graph to determine the ERS.

10% 3A) **Diagram a typical shotgun skyline logging system with slack-pulling lateral-yarding capability (in profile view)**. For the logging system components listed below, clearly label the necessary components of this logging system on your diagram. (Use the blank piece of graph paper on the next page. **Be sure to hand it in with your Applicant's Number filled-in.**)

State if any of these components are not necessary and the reason why:

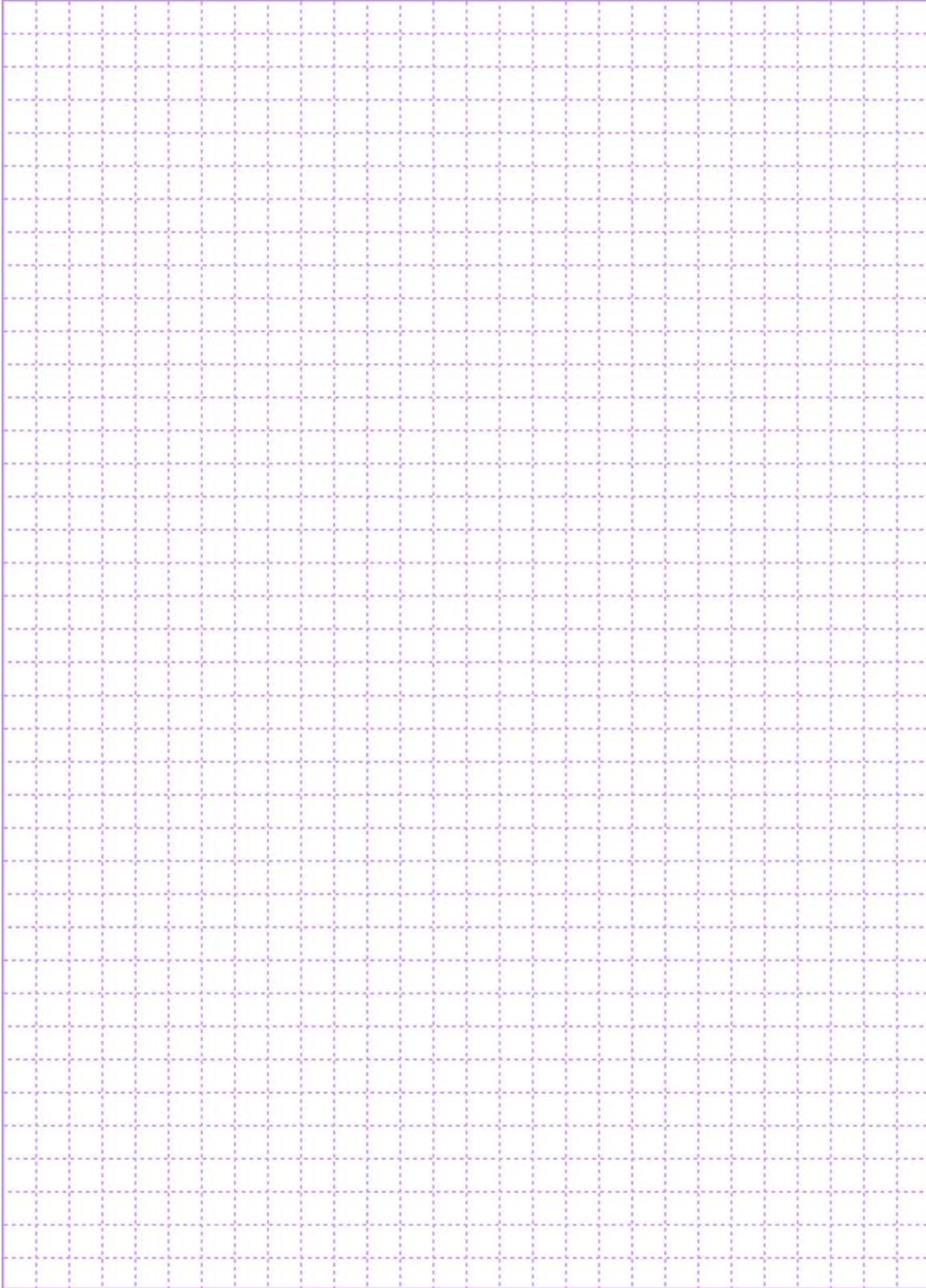
- A. Skyline Cable
- B. Haulback Cable
- C. Mainline Cable
- D. Strawline Cable
- E. Carriage

5% B) Briefly describe the topographic and equipment conditions necessary for the shotgun cable system to effectively operate.

10% C) Briefly describe how the carriage you are depicting derives its slack-pulling capability and how the carriage you are describing maintains its position during slack-pulling and lateral yarding of logs into the cableway. You may draw a diagram to aid your description, if you find that to be useful.

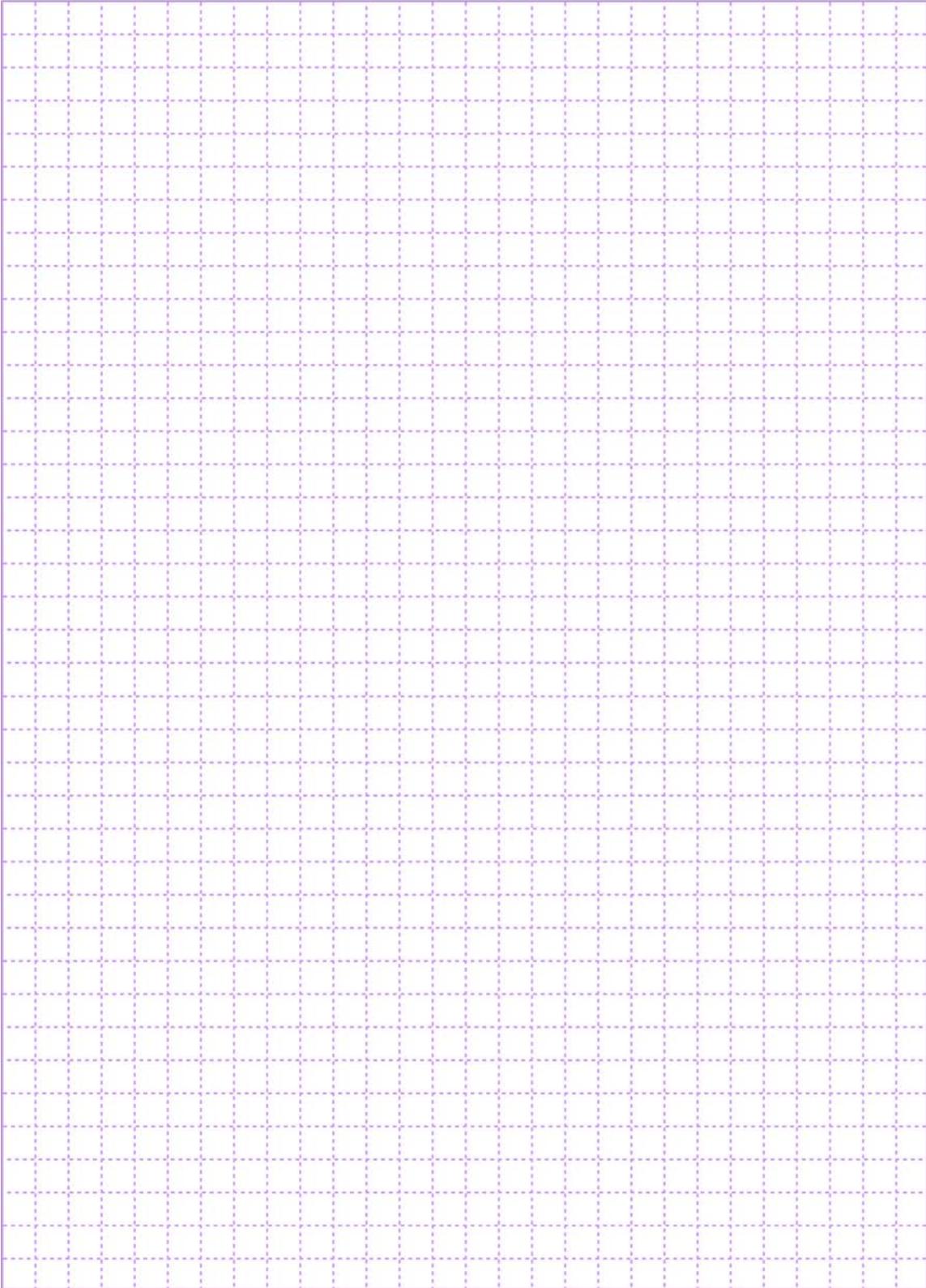
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QUESTION VI-FOREST ENGINEERING REQUIRED GRAPH PART 2 ABC



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QUESTION VI-FOREST ENGINEERING REQUIRED DIAGRAM PART 3 A



END OF QUESTION

QUESTION VII-FOREST ECONOMICS**OBJECTIVE**

This question is to assess your ability to use economic analysis to determine an optimal allocation of reforestation funds.

SITUATION

Assume you are in charge of the reforestation program for a private landowner with approximately 100,000 acres of generally unstocked or under stocked forestland. (The need for restocking is not a result of harvesting activity.) Not all acres require restocking, but individual areas in need of regeneration vary widely in site quality, location, climatic conditions, and presence of competing vegetation. You are given a budget of \$1 million with instructions to allocate it over the next five years in the most financially appropriate manner among various reforestation opportunities (reforestation projects) that are available.

QUESTION

- 45% 1. Using **generally accepted** economic principles, **BRIEFLY** describe **three (3) economic** criteria/methodologies you might use for judging the **financial appropriateness** of a **single** reforestation opportunity. Be certain to state any assumptions.
- 30% 2. Explain briefly the type of information you would need for assessing or using each of these criteria/methodologies.
- 25% 3. Develop and justify **ONE (1)** criteria/methodology for **allocating your total budget among the alternative opportunities**, as required by your employer.

(END OF QUESTION)

QUESTION VIII- FOREST ADMINISTRATION**OBJECTIVE**

To demonstrate your knowledge of the required minimum stocking requirements for harvested timberlands in California.

SITUATION

You receive a call from a client who wishes to purchase an 80-acre parcel of California timberland which has recently been harvested (within the last 3 years). She is concerned about the stocking on the harvested area and whether it is adequate to meet the State's requirements under the California Code of Regulations (California Forest Practice Rules and Regulations).

QUESTIONS

- 25% 1. Briefly explain the general and specific requirements regarding stocking after the completion of timber operations under the California Forest Practice Rules (FPRs) and Regulations.
- A. 5 % Explain the general process under the FPRs to your client.
 - B. 5 % Explain to your client how satisfactory stocking is determined. Include how the new landowner might be affected if stocking requirements are not satisfactory at this time.
 - C. 5 % Explain to your client stocking time deadlines.
 - D. 5 % Explain to your client any penalties or corrective measures that might apply if stocking is not accomplished.
 - E. 5 % Explain to your client her options if the owner has not met requirements regarding stocking
- 30% 2. Briefly, **describe three (3)** of the four types of approved stocking **sampling procedures** you might use to survey the parcel to determine stocking adequacy. Give an example for each sampling procedure you describe. Use a different silvicultural method for each example.
- 20% 3. Describe the application of the concept of "least stocked 40" and the underlying sampling assumption related to that concept.
- 15% 4. Explain the significance of the Group A and Group B commercial species lists in the FPRs and how they relate to resource conservation standards for minimum stocking.
- 10% 5. Explain to your client, what constitutes a "countable tree" under the FPRs.

(END OF QUESTION)

QUESTION IX- FOREST POLICY**OBJECTIVE:**

To demonstrate your knowledge of the privileges and responsibilities granted under the California Professional Foresters Law, Forest Practice Rules and Forest Practice Act.

SITUATION:

Assume that you are a Registered Professional Forester (RPF). Yesterday you received a Registered Letter from The Professional Licensing Office for RPFs in Sacramento. In **summary, the letter states** that it is documented that you have **received nine (9) THP violations** in the last 5 years. The **most recent Notice of Violation** indicated gross mischaracterization of the slopes upon which a proposed road alignment was to be constructed under an amendment to an existing plan. **Another Notice of Violation** reported that you failed to identify an unstable area located along a proposed road alignment.

The letter summarizes that the Professional Forestry Examination Committee and the Board of Forestry and Fire Protection believe that the history of Forest Practice Rule **violations support the following accusations as defined under Resources Code, Section 778(b):**

- A) Gross negligence,
- B) Incompetence,
- C) Misrepresentation, and
- D) Material misstatement of fact in the practice of forestry.

40% 1. Briefly **define and contrast** the charges of gross negligence, incompetence, misrepresentation, and material misstatement of fact in the practice of forestry that have been lodged against you. **Examples might be useful for how the State may: "Prove" that charge of a failure of responsibility.**

15% 2. Section 1613 of the FPRs provides for denial, suspension or revocation of an RPF's license if he/she is convicted of a felony with "a substantial relationship criteria". **Define and explain** under what conditions and circumstances this licensing disciplinary criteria may be applied and justified. **Examples would be useful.**

20% 3. As an RPF, you sign a THP prepared by your apprentice graduate forester. **You did not personally visit the harvest plan area.** However, you believe the area is not erosion-prone with no class I, II, or IV streams in the THP area and a selection harvest is proposed. You also believe that your apprentice has adequate experience to do the fieldwork and prepare the THP (over three years with your firm). **Have you performed a disciplinable act** by signing the plan under the circumstances? Also **discuss an RPF's level professional of responsibility** under the described circumstances.

25% 4. As an RPF you retain a wildlife biologist's service in preparing a THP **after** notifying your client and getting the client's permission. **You pay the biologist** for his work. You then add a 15% charge to the biologist's fee on to your bill to the client. **Discuss** whether the RPF might be guilty of any violations of the Professional Foresters Law.

END OF QUESTION

QUESTION X- FOREST MANAGEMENT

OBJECTIVE:

Demonstrate your understanding of Road Management Plans.

SITUATION:

As a RPF leading the development of a Road Management Plan (RMP), your goal is to insure that your team understands the Plan contents **required by the FPRs**. At your initial meeting you answer their questions.

QUESTIONS:

10% 1. What is the **intent** of a Road Management Plan?

15% 2. The Guidelines for Orderly Evaluation of Activities Proposed by a RMP list seven specific requirements. One of these requirements is the "Identification, prioritization and implementation of road-related activities". What **three (3) objectives** is this requirement intended to accomplish?

15% 3. List **three (3)** more of the requirements listed in the Guidelines for Orderly Evaluation of Activities Proposed by a RMP. Do **not** use the requirement discussed in #2 above.

40% 4. The contents of the Road Management Plan must contain a goals and objectives element, an evaluation element, an operational element, a verification element, and an adaptive management element. List and briefly explain the contents of any **four (4)** of these elements.

20% 5. The inventory and assessment of the road system shall include what items?

END OF QUESTION

END OF EXAM