Applicant #:_____
Question # ___I_____
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.

Professional Foresters Registration Examination, October 2019

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)

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

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.

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.**

Acronym or Abbreviation	Full Text
BLM	Bureau of Land Management, USDI
BOF	California State Board of Forestry and Fire Protection
CA	California
CCR	California Code of Regulations
CAL FIRE	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

FA=Forest Admin, FE=Forest Ecology, FEng= Forest Engineering, FEcon= Forest Economics, FM= Forest Management, FPol= Forest Policy, FP= Forest Protection, FMens = Forest Mensuration, FS=Silviculture

October 2019 RPF EXAMINATION

3%   1. Besides CO_2, name three (3) other naturally occurring "**greenhouse gases**" present in Earth's atmosphere.

_____   _____   _____

3%   2. The total assimilation of energy and nutrients by an organism or a plant

community per unit of time is called _____ production.

3%   3. What is **phloem** of a tree, and how does it function?

_____

_____

3%   4. A deduction from taxable income, allowed under specific conditions, by U.S. tax laws to the owners of timber for reduction of an original growing stock through cutting is called:

_____

3%   5. The difference between the greater volume actually sawn over the lesser estimated log scale volume is called:

_____

4%   6. State two (2) silvicultural (not regulatory) reasons that reforestation surveys are done.

_____

_____

3%   7. What is **Integrated Pest Management**?

_____

_____

CONTINUED NEXT PAGE

3%   8. As used in the FPRs, what is meant by the term "**Properly Functioning Salmonid Habitat**"?

_____

_____

3%   9. How do the FPRs define the **Fire Protection Zone** (Hazard reduction area)?

_____

3%   10. As used in forest archaeology, describe a **"midden".**

_____

_____

3%   11. The THP is a part of a process that has been certified as
_____ to an EIR subsequent to a decision by the
Secretary of the California Resources Agency.

4%   12.   The intent of the Forest Practice Act is to regulate timberlands to
assure what two (2) results?

_____

_____

3%   13. In a forest stand, the trees that form the general level of the forest
canopy and receive full light from above, but comparatively little from the sides are
silviculturally classed as: _____

3%   14.   All members of the California Board of Forestry and Fire Protection are
appointed by the Governor on the same basis regardless of the appointees'
employment or business interests. Describe **composition of the California Board
of Forestry and Fire Protection members**.

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.

3%   15. Why does the concept of MAI not apply well to uneven- age stands?

_____

3%   16. Briefly describe what is meant by the term "**adaptive management**" as it applies to forest management.

_____

_____

3%   17. The distance from a landing to the farthest point in the cutting unit is called the: _____

3%   18. A scale of 1: 6,000 on a map translates to how many feet per inch on the ground? Show your work.

_____

3%   19. As used in forest mensuration, what is **Ingrowth**?

4%   20. List four (4) **genera of the Fagaceae** family found in North America.

_____

3%   21. What is the **difference** between a stand's arithmetic mean diameter and its quadratic mean diameter?

CONTINUED NEXT PAGE

3%   22. A rectangular piece of land measures 40.2 chains by 78.6 chains. How many acres (round to acres) are in this piece of property? Please show your work including the units of measure.

3%   23. How does the **Net Present Value calculation** for a proposed crop rotation **change as inflation rates change**?

3%   24. In a geomorphic feature formed by coalescing scars originating from landslide and processes caused by active stream erosion, the feature that is identified as the area beginning immediately adjacent to the stream channel below the first break in slope is termed:

3%   25. What is meant by the term **BLM Cadastral survey**?

3%   26. What are the three (3) traditional **appraisal techniques** for **timberland valuation**?

3%   27. Silviculturally, what is usually meant by an **intolerant species**? Include a common example of a tree species that is intolerant.

CONTINUED NEXT PAGE

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.

4%   28. List four (4) purposes a THP document serves during its life:

_____

_____

_____

_____

3%   29. What other law was brought to bear on the Forest Practice Act by the court ruling in Natural Resources Defense Council, Inc. v. Arcata National Corp. (or "Broaddus Decision") [Answer must be written out in its entirety, no abbreviations]?

_____

3%   30. List three (3) results of **intense forest wildfire** on carbon stocks **and** sequestration.

_____

_____

_____

3%   31. List three (3) general effects of **sawtimber harvesting** on forest carbon stocks **and** sequestration?

_____

_____

_____

3%   32. According to the FPRs, what is the logging area of a THP?

_____

_____

END OF QUESTION # I

QUESTION II - FOREST MENSURATION

OBJECTIVE
To demonstrate your ability to understand and utilize basic mensurational data.

SITUATION
A consulting forester is developing a management plan for a 10-acre ownership in California. To generate information about the vegetation on the property, the forester established random sampling plots, the information from two of which is attached. At each location, the forester set the following types of plots and measured the associated variables:

- A variable radius plot (or prism) sample using a basal area factor of 30 (English units, square feet per acre). For each "in" tree on the prism plot over 10-inches DBH, the forester measured: Dbh in inches to the nearest 1/10th inch, and Height to the nearest foot
- A 1/250-acre circular plot. For each tree between 2-inches and 10-inches dbh, measure and record in 2-inch dbh classes
- A 0.001-acre square quadrat in which the total number of seedlings was counted.

All trees measured in the inventory were ponderosa pine. For each tree measured, the forester predicted volume (cubic feet to a 4" top) using the formula:

$v = -1.0454 + 0.002706 (d^2 \times ht)$
in which:
d = Dbh in inches to the nearest 1/10th inch,
ht = Total height in feet.

COMPUTATIONAL QUESTIONS - Based on the data presented in the attached summary at the end of this question, estimate the following (**SHOW YOUR WORK**):

5%   1.   The mean basal area per acre for the property using trees over 10" dbh.

5%   2.   The mean volume/acre for the property using trees over 10" dbh.

5%   3.   The mean number of trees per acre for the property using trees over 10" dbh.

5%   4.   The estimated standard deviation of the basal area per acre among the sample plots. (Equation provided with data summary at end of question)

5%   5.   The sampling error around the estimated mean basal area per acre for the property. (Equation provided with data summary at end of question)

5%   6.   The total number of 8-inch dbh trees on the property.

5%   7.   Cubic foot volume to a 4-inch top of tree #2 at sample location #1.

5%   8.   The mean number of seedlings per acre on the property.

CONTINUED NEXT PAGE

OCTOBER 2019 RPF EXAMINATION

NON-COMPUTATIONAL QUESTIONS-Based on the data presented in the attached summary, Answer the following:

10%   10. Write a <u>formula</u> (do not do calculations) for calculating <u>quadratic mean diameter</u>.

15%   11. Cite <u>three (3) reasons</u> for using strip cruising instead of prism points or fixed-size plots to improve efficiency in the field.

15%   12. It has been suggested that it is permissible (even desirable) to <u>change prism factors from point to point</u> to help equalize the number of trees selected over all the points. <u>Is this a statistically valid procedure? Why</u>?

20%   13. It has been recommended that when <u>cruising on steep ground with a prism</u>, sample trees should be selected only from a 180-degree arc downhill from the center point. If this procedure were followed:
a) what change should be made to the basal area factor? And
b) what would be the effect of this procedure on the sampling error assuming a homogeneous stand.

CONTINUED NEXT PAGE

DATA SUMMARY
The data obtained from the field measurements are:

PRISM POINTS

Location	Tree #	Dbh	Ht	ba	v/ba	1/ba
#1	1	22.1	111	2.66	54.76	0.38
	2	14.6	64	1.16	30.92	0.86
	3	32.1	135	5.62	66.79	0.18
	4	18.6	102	1.89	49.97	0.53
	5	20.3	112	2.25	55.04	0.44
	Subtotal			13.58	257.48	2.39
#2	1	12.3	43	0.83	19.95	1.20
	2	28.2	122	4.34	60.25	0.23
	3	14.6	54	1.16	25.95	0.86
	4	31.2	142	5.31	70.24	0.19
	Sub-total			11.64	176.39	2.48

1/250-ACRE PLOT

Location	Dbh Class	Number of Trees
#1	6	4
	10	3
#2	2	2
	4	1
	8	1

DATA SUMMARY (CONTINUED)

1/1000-ACRE QUADRAT

Location

#1	*2 seedlings*
#2	*0 seedlings*

1/1000-ACRE QUADRAT

Location

#1	2 seedlings
#2	0 seedlings

STATISTICAL EQUATIONS PROVIDED

Standard Deviation:

$$SD = \sqrt{\frac{\bullet \ (X - \overline{X})^2}{n - 1}}$$

Sampling Error:

$$SE = \frac{SD}{\sqrt{N}}$$

END OF QUESTION

QUESTION III-FOREST ECOLOGY

OBJECTIVE
To demonstrate your knowledge regarding the relationship between water and energy, and successful tree regeneration.

QUESTION
The water relations and energy environment of trees are always important and are especially critical during the regeneration stage of a stand.

20%   1. Duff is usually a poorer seedbed than mineral soil for establishment of conifer seedlings from natural seed fall or broadcast seeding. Explain the plant water and energy relationships that make this statement correct.

20%   2.   In terms of plant water and energy relationships, discuss four (4) reasons for the generally beneficial effect of shade on seedling survival (assume that shade is not so excessive as to be detrimental to seedling health).

30%   3. Describe five (5) common errors in tree planting techniques.   Explain, in terms of plant water and energy, the adverse effect of each on survival and health of the planted tree. (Assume satisfactory planting stock and proper handling is used; do **not** use lack of utilization of dead shade as an answer).

30%   4. Consider a tree seedling recently planted in an unshaded inland forest site. Assume "typical" late spring, mid-afternoon, mostly sunny conditions. Indicate the direction of change in rate of transpiration (increase or decrease) you would expect as a result of each of the following changes in environmental conditions. Regard these as five separate, unrelated situations. Explain each response in terms of the applicable physical/biological processes (If you need to make further assumptions to qualify any of your answers, state them briefly):
a. A cloud shadow passes over the seedling.
b. Wind speed increases from a slight to moderate breeze.
c. Air temperature increases with no change in solar radiation.
d. Relative humidity falls with no change in air temperature.
e. Soil moisture is gradually depleted, with no change in other conditions.

END OF QUESTION

QUESTION IV FOREST SILVICULTURE

OBJECTIVE:

To demonstrate understanding of biodiversity principles and their application to managed stands.

SETTING:

The timberland of California. Understanding the genetic impacts of silvicultural practices is crucial for conservation and management of forest genetic resources. Survival and productivity of both tree and non-tree species can be compromised or, possibly, enhanced.

QUESTIONS:

5%   1.   What is **biological diversity**?

5%   2.   What is the **genetic basis** of biological diversity?

5%   3.   What are the main **sources of genetic diversity** in forests?

5%   4.   Why is an understanding of the **genetic impacts of silvicultural practices** crucial for conservation and management of forest genetic resources?

20%   5.   What determines the **extent of genetic impacts** of forest management on trees? <u>Compare **and** contrast management</u> effects and <u>natural disturbance</u> effects **on genetic diversity**.

15%   6.   Discuss in general terms what determines the **genetic impacts** of **Selection** forest management regimes **utilizing natural seed fall regeneration** on commercial tree species? Discuss how your concepts apply to a high site Sierra Mixed Conifer stand managed by Single Tree Selection with a residual stand density of ~150 sq. ft. / ac. basal area.

15%   7.   Discuss in general terms what determines the **genetic impacts** of **Seed tree** forest management regimes **utilizing natural seed fall regeneration** on commercial tree species? Discuss how your concepts apply to a high site Sierra Mixed Conifer stand managed by Seed Tree seed step silviculture with a residual stand density of ~15 sq. ft. / ac. basal area.

15%   8.   Discuss in general terms what determines the **genetic impacts** of **Shelterwood** forest management regimes **utilizing natural seed fall regeneration** on commercial tree species? Discuss how your concepts apply to a high site Sierra Mixed Conifer stand managed by Shelterwood seed step silviculture with a residual stand density of ~50 sq. ft. / ac. basal area.

15%   9.   What determines the **genetic impacts** of **even age** forest management regimes utilizing **plantation regeneration** on commercial tree species?

End of Question

QUESTION V- FOREST PROTECTION

OBJECTIVE:

To demonstrate understanding of environmental and operational issues related to road use and watercourse drafting.

SETTING:

The timberland of California. Understanding watercourse drafting and effects of road use are critical to environmental analysis and timber harvest operations. Many forest roads in timber harvest areas are surfaced with packed native soil or crushed rock.

QUESTIONS:

5%   1.   According to the FPRs and PRC, what is a **watercourse**?

12%   2.   List four (4) **potential adverse effects** that may occur when heavy equipment, log trucks and chip vans use these roads **during the dry season**?

18%   3.   Discuss three (3) **resources that may placed at risk** by these potential adverse effects, include **how** the resource might be adversely affected.

20%   4.   List two (2) **mitigation measures** (other than paving) that are **most commonly** used to reduce the potential adverse effects you listed in # 2 above. Discuss the details (materials, procedures, risks, durability) of each of these mitigations.

10%   5.   Discuss the potential adverse effects of water drafting on **aquatic species**.

10%   6.   Discuss any two (2) of the common Water Drafting/Diversion general types: In-channel, Off-channel, Diversion and Storage.

5%   7.   What is the basic requirement of a Fish and Game Code Lake and Streambed Alteration § 1600 *et seq* permit?

5%   8.   Fish and Game Code § 5901 states that it is Unlawful to Prevent or Impede Fish from Passing in Streams. What is the Fish and Game Code **definition of "Fish"**?

5%   9.   What are some common mitigation measures to **reduce sediment** leaving water drafting site approaches and entering watercourses?

5%   10.   What are some common mitigation measures to **mitigate hazardous waste** from equipment near water drafting sites?

5%   11.   Name two (2) **Diseases or Invasive Species** that may be of concern and potentially disseminated by water drafting activities?

End of Question

Professional Foresters Registration Examination October 2019

Part II

**Applicant Must Also <u>Answer Three</u> 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 demonstrate your ability to perform basic elements of mapping and designing a logging road
  to fit physical, economic and environmental requirements.

SITUATION:

You have accepted a job to provide a forest landowner with a preliminary plan for harvest access
within the timbered property she has just acquired. The first report from you should consider the
following requirements and goals:

 A. Provide a <u>map showing property lines</u>.
 B. Outline a <u>feasible road plan</u> which is located on the owner's property, and which considers
 the owner's goals and constraints and is disconnected from the watershed.
 C. <u>Avoid substantial damage</u> to wet areas, springs and streams by minimizing construction
 and crossings of these areas.
 D. Assume that the <u>land use will be for timber production and the land is zoned TPZ</u>.
 E. The most likely direction of <u>future timber hauling will be to the west.</u>

QUESTIONS:

(NOTE: TWO COPIES OF THE MAP ARE PROVIDED <u>AT THE END OF THIS QUESTION.</u>
<u>YOU MAY USE ONE COPY FOR A SPARE IN CASE YOU WISH TO REVISE YOUR</u>
<u>ANSWER. **YOU NEED ONLY HAND IN ONE MAP**. BE SURE TO SUBMIT THE MAP</u>
<u>WITH YOUR ANSWER. BE SURE TO PLACE YOUR APPLICANT'S NUMBER ON THE</u>
<u>THE MAP.)</u>

10% 1. On the attached map, <u>draw property lines</u>, as close as possible on the map
    provided, based on the following description from the Grant Deed *(Note-* <u>that the center</u>
    <u>of Sec. 34 is marked by the number "34" in the lower left quadrant of the map.</u>):

        Section 34: The West Half of the Northeast Quarter; and, The Southwest Quarter
            of the Northeast Quarter of the Northeast Quarter; and The North Half of the
            North Half of the Northwest Quarter of the Southeast Quarter.

 15% 2. Assume a <u>perfect, square land survey grid of the area</u>. State the anticipated
        <u>acreage of each described sub-parcel</u> (see Question 1) and the <u>total acreage</u> of the
        property.

 15% 3. Within the subject ownership being considered in this Question, <u>identify and draw</u>
        <u>a line around each wet area or spring shown on the map</u> (assume the standard USGS
        mapping symbol for a wet area or spring<u>). At the property line, indicate each Class II</u>
        <u>stream by placing a "V" across the stream symbol, with the vertex of the "V" pointed in</u>
        <u>the direction of water flow.</u>

Continued on Next Page

15%   4. Using the map legend information and the map provided, compute the following topographic quantities:

A. 5% grade is _____ feet elevation change per map inch.

B. If you were to plot a road segment on the map that started on one contour line and ended on the next and was 0.75" long, what is the grade represented by that segment?_____.

C. Assume that tractor skidding is limited to 35% slope. If your proposed harvesting area contains 4 consecutive contour lines in 1-inch can you use the tractors? State your reasoning with supporting computations.

45%   5.   Plan a <u>road system for the **entire ownership**</u>. Sketch it on the map using the symbols on the map legend.

For road segments, <u>designate potential landings</u> appropriate to serve the logging systems to be used. Show road location to the nearest half-contour AND <u>indicate on the map the direction of loaded haul for logging trucks (You may use any symbol or designation method, such as arrows. Just be sure to make it clear to the grader which way is the direction of loaded haul).</u> For <u>all Class II stream-crossing show locations on map with the designated symbol</u>.

<u>In an appropriate and clear manner designate</u> which areas are to be cable and tractor-yarding areas. Use the **T** or **C** legend symbols provided on the map legend. If no appropriate symbol is provided, you may construct one and add it to the legend. You are subject to limitations stated in the SITUATION description and the following additional constraints:

A. <u>"Old Road" cannot be used for landings or skidding</u> upon as it is a county road with pavement. Only construction for <u>new encroachment is permissible</u>. No right-of ways have been obtained, hence <u>all new roads must remain within the ownership</u>.

B. <u>Favorable truck road grades may be as steep as 15%.</u> <u>Adverse truck road grades may be as steep as 10%.</u>

C. <u>Tractor yarding may be conducted on slopes as steep as 35%,</u> <u>minimum area of 5 acres</u>. Downhill tractor yarding is preferred, <u>maximum (external skidding) distance to landings is 1,000 feet;</u> <u>uphill tractor yarding is limited to a maximum of 200 feet.</u>

D. <u>Cable yarding must be conducted on slopes greater than 35%,</u> <u>minimum area of 5 acres</u>. <u>Cable yarding must be uphill,</u> <u>maximum (external yarding) distance from landings is 800 feet, and away from streams</u>, if possible.
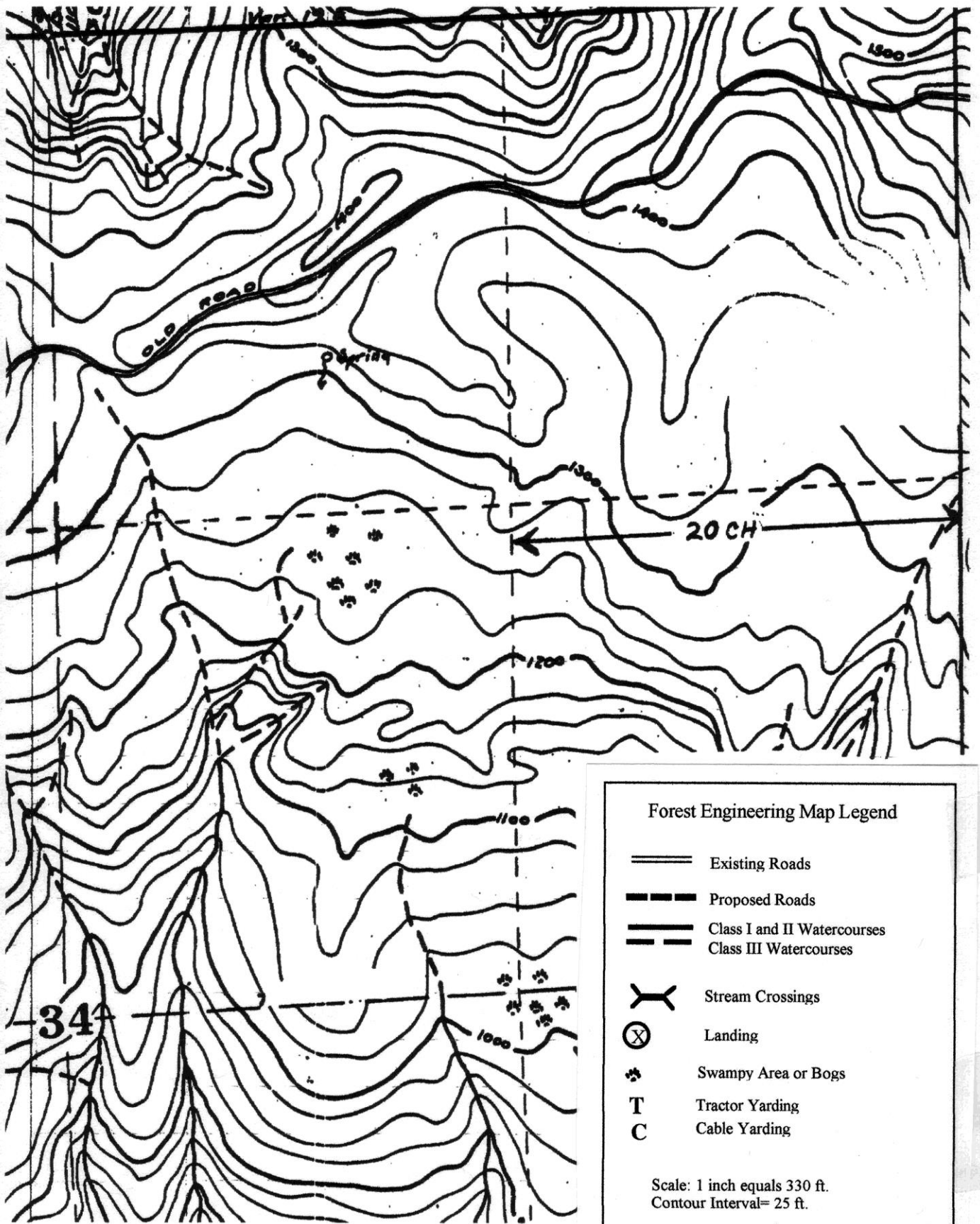
(END OF QUESTION)
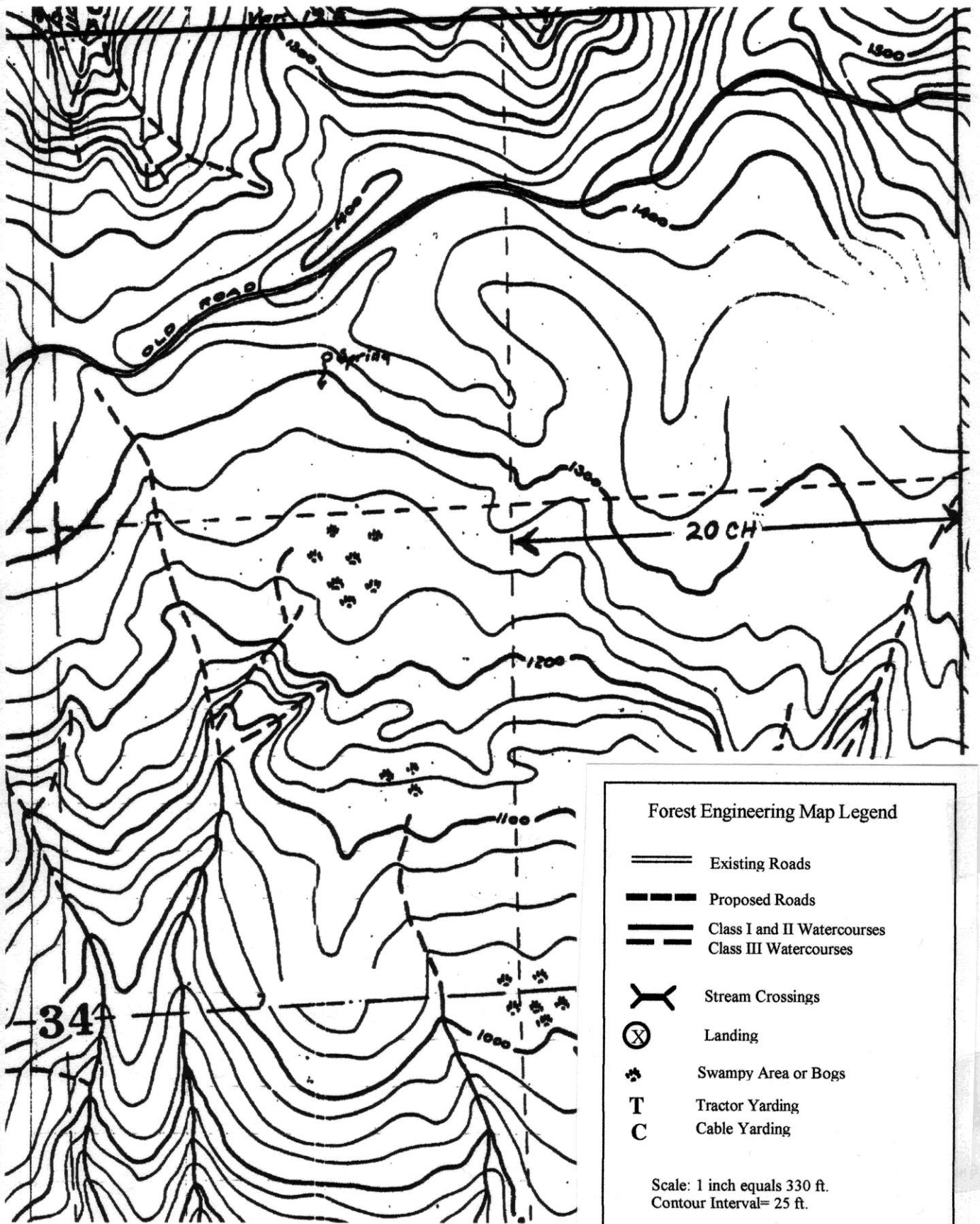
Forest Engineering Map Legend

═══════	Existing Roads
▬ ▬ ▬ ▬	Proposed Roads
═══ ═══	Class I and II Watercourses
▬ ▬ ▬	Class III Watercourses
✕	Stream Crossings
Ⓧ	Landing
❀	Swampy Area or Bogs
T	Tractor Yarding
C	Cable Yarding

Scale: 1 inch equals 330 ft.
Contour Interval= 25 ft.

Forest Engineering Map Legend

═══════	Existing Roads
▬ ▬ ▬ ▬	Proposed Roads
══ ══ ══	Class I and II Watercourses
▬▬ ▬▬	Class III Watercourses
✕	Stream Crossings
⊗	Landing
❀	Swampy Area or Bogs
T	Tractor Yarding
C	Cable Yarding

Scale: 1 inch equals 330 ft.
Contour Interval= 25 ft.

END of QUESTION

OBJECTIVE:

To demonstrate understanding of Forest Management Decision-Making.

SETTING:

The timberland of California. Understanding the various Forest Management Decision Making tools available is critical to their use in planning applications.

QUESTIONS:

10%   1.   Briefly <u>outline the basic steps</u> in the general **decision-making process** used in forest management <u>planning</u>.

30%   2.   Define any three (3) of the following **Financial decision methods** concerning proposed Forest Management Decisions: Net Present Value (NPV), Benefit Cost ratio (B/C), Internal Rate of Return (IRR), Equal Annual Equivalent (EAE) or Land Expectation Value (LEV).

20%   3.   Many forest management decision models (usually computer software aided) are commonly utilized to support forest management decisions. Discuss the most common method: **Linear programming**. Be sure to characterize the **process**, **uses**, **limitations** and **assumptions**.

10%   4. How is the **interest rate "i"** determined for a Net Present Value calculation?

SETTING: By necessity, all decision-making about the future is done with some uncertainty and risk.

15%   5. Define and discuss **risk** in forest management planning. Give a <u>real-world example of risk</u> in forest management planning. How can forest management decisions <u>cope with risk</u>?

15%   6. Define and discuss **uncertainty** in forest management planning. Give a <u>real-world example</u> of uncertainty in forest management planning. How can forest management decisions <u>cope with uncertainty</u>?

End of Question

QUESTION VIII- FOREST ADMINISTRATION

OBJECTIVE:

To demonstrate understanding of environmental mitigation measures and how to effectively apply them.

SETTING:

The timberland of California. Understanding how to mitigate the potential adverse effects of timber operations is critical to developing and implementing Timber Harvest Plans.

QUESTIONS:

10%   1.   What do the FPRs and CCRs require about environmental effects of activities proposed under a THP?

10%   2.   With regard to THP mitigations, how do the FPRs define **feasible** and **economic feasibility**?

10%   3.   As required by CEQA for THP review, what is a THP **project alternative** (not an alternative practice)? State three (3) <u>typical</u> THP project alternatives.

15%   4.   What are the five (5) **general types of mitigations** listed in the CCRs and CEQA?

5%   5.   **Who** is responsible for **implementing** mitigations that are part of a THP?

10%   6.   In developing THP mitigations, what **degree of specificity** must be used to <u>explain</u> the proposal? Give an example.

15%   7.   When developing THP mitigations, what specifically must be stated about **why** an <u>alternative practice</u> to standard FPR mitigation is appropriate?

15%   8.   What constitutes an **enforceable standard** for a proposed mitigation? Give an example.

10%   9.   What are the process and **limits imposed on State Agencies** (not Cal Fire) when reviewing proposed THP mitigations?

End of Question

QUESTION IX- FOREST POLICY

OBJECTIVE:

Demonstrate your knowledge of the laws and agencies a RPF must work with to facilitate timber operations in California.

SITUATION:

Assume that you have the responsibility for planning and supervising harvesting operations on an area of privately-owned forestland in California.

QUESTIONS:

10%   1. Identify **five** (**5**) separate **State** regulatory agencies, Boards or Commissions with which you may have to work with in preparing and administering your THP.

45%   2.   **List** and briefly **discuss** the **principal** laws through which each of the State agencies, Boards or Commissions (that you have listed in Question 1 above) have authority to impact forest practices.

45%   3.   For the **five (5)** State agencies, Boards or Commissions that you listed in Question 1, **explain** how each interacts with other State agencies, Boards or Commissions and **meets** its regulatory obligation.

END OF QUESTION

QUESTION X- FOREST MANAGEMENT

OBJECTIVE

To demonstrate your understanding of ecological tradeoffs present when making management decisions.

SITUATION

California black oak (*Quercus kelloggii*) is common in a large portion of California. California black oak exceeds all other California oaks in volume, distribution, and altitudinal range. California black oak is a component of six forest cover types. California black oak is a commercial species under the FPR. Yet this hardwood has had little sustained commercial use and very little management directed at its sustainability. In some parts of the Sierra Nevada it was common practice to fall all California black oak as part of commercial forest practices.

QUESTIONS:

15%   1. Briefly describe (five) 5 identification characteristics of California black oak that would positively distinguish it from other *Quercus* species.

45%   2. Discuss the significance of California black oak as a component of the mixed conifer forest ecosystem. Discuss both positive and negative effects on the ecosystem if California black oak is eradicated in regenerated areas.

40%   3. Describe why sprouting appears to be the dominant source of most black oak regeneration and its effect on the resulting stand. Discuss how this affects black oak control when it is desirable to reduce the California black oak component in a stand (thinning, sanitation removal for mistletoe, etc.), Discuss five (5) **effective control methods** that are available.

END OF QUESTION

END OF EXAM