



PREPARING FOR THE NCEES
PRINCIPLES & PRACTICE EXAM AND
THE SPE CERTIFICATION EXAM

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Background



- Certification Exam
 - Run by SPE
 - Committee develops the database of questions using the same “rules” and specifications as the US PE Exam
 - Computer-based test (CBT)
 - 70 multiple-choice questions over 7 hours (35 morning; lunch; 35 afternoon)
 - SPE Petroleum Engineering Handbook and SPE Petroleum Engineering Certification and PE Licensure Exam Reference guide are the only references allowed into the exam
- US PE License Exam
 - Run by the National Council of Examiners for Engineering and Surveying (NCEES) with “help” from SPE
 - Separate SPE committee develops the database of questions – database “owned” by NCEES
 - “Paper and pencil” exam through next year and then Computer-based test thereafter (current plan)
 - 80 multiple-choice questions over 8 hours for paper and pencil exams and then 70 questions over 7 hours for CBT
 - Current “rules” for references are generally that they be “bound” (not stapled but three-ring binders OK) with no handwriting; can have “flags”



Background



- NCEES web site: www.ncees.org
 - Engineers→Learn about the exams→PE Exam→Petroleum
 - There is a link for
 - PE Petroleum Exam Specifications
 - NCEES Examinee Guide
 - Exam day policies (NCEES/State licensure organization – SPE for CE)
 - Calculator policy
 - Pass rates (Petroleum)
 - October, 2016 1st time takers = 66%; 40% repeats
 - There is a link also for Scoring (cut scores and how graded) and a sample Diagnostic Report (ME not PETE though)



Breakdown of PE Exam



Topic	% of Exam	PE #Problems	CE #Problems
• Drilling	25%	20	17 – 18
• Production/Completions	27.5%	22	18 – 19
• Facilities	15%	12	10 – 11
• Reservoir	25%	20	17 – 18
• Project Management	7.5%	6	5 – 6



Exam Specifications



NCEES Principles and Practice of Engineering Examination
PETROLEUM

Effective Beginning with the October 2014 Examinations

- The exam is an 8-hour open-book exam. It contains 40 multiple-choice questions in the 4-hour morning session, and 40 multiple-choice questions in the 4-hour afternoon session. Examinee works all questions.
- The exam uses both the International System of units (SI) and the U.S. Customary System (USCS).
- The exam is developed with questions that will require a variety of approaches and methodologies, including design, analysis, and application.
- The knowledge areas specified as examples of kinds of knowledge are not exclusive or exhaustive categories.



From <https://ncees.org/wp-content/uploads/2015/07/PE-Pet-Oct-2014-1.pdf>

PE Exam Specifications



Approximate Number of Questions
20

I. Drilling

- A. Casing and tubulars (e.g., collapse, burst, and tensile strength; grade; connections; working design)
- B. Cementing (e.g., properties, yield, placement, downhole equipment, testing protocols)
- C. Drilling fluids (e.g., rheology, chemistry, oil base/water base, density, hydraulics calculations, pore pressure, leakoff, fracture gradients, wellbore stability)
- D. Drill string and BHA (e.g., available weight, overpull, equipment, location in string, tubular movement)
- E. Drilling mechanics (e.g., rock properties, drill-off test, torque and drag)
- F. Hydraulics (e.g., pressure drops, nozzle selection, fluid velocities, BCD, mud pump performance)
- G. Rig equipment capabilities (e.g., equipment, pressure ratings, size and configuration)
- H. Directional/horizontal drilling (e.g., motors, calculations, steering, TVD/MD, horizontal displacement, vertical sections)
- I. Wellheads (e.g., equipment, pressure ratings, size and configuration)
- J. Well control/blowout preventer (e.g., kick tolerance, well kill methods, equipment, trip margins, swell and surge pressures)
- K. Solids control (e.g., equipment, process, removal)
- L. Fishing (e.g., equipment, techniques, stretch, stoppoint, freepoint/backoff)
- M. Bits (e.g., classification, cutting structures, grading, ROP, nozzle size and velocity, jet impact, hydraulic horsepower)
- N. Underbalanced drilling (e.g., candidate selection, air, foam, equipment, rotating blowout preventers)
- O. Deepwater drilling (e.g., rig type, mooring, riser analysis, subsea equipment)



From <https://ncees.org/wp-content/uploads/2015/07/PE-Pet-Oct-2014-1.pdf>

SPE Competency Matrices



Competency Matrix for Drilling Engineers
SPE Task Force on Minimal Competency From <http://www.spe.org/training/drilling-engineering-competency-matrices.php>

Drilling Task	Drilling Knowledge/Skill*		
	Minimum Competence Breadth	Minimum Competence Depth	Above Minimum Competence
Maintain well control.	Calculate mud weight necessary to maintain well control and volume of mud required to fill the hole while tripping out.	Design and/or implement procedure to successfully circulate out an influx. Determine fluid type of influx with data collected after influx. Understand relationship between gas-cap, depth, volume and casing depth reference.	Design and/or implement procedure to successfully contain an underground blowout.
Develop casing program (rates, setting depths).	Develop a casing program based a provided pore pressure/true gradient plot. Understand relationship between desired production flow rates and tubing casing configuration.	Determine the surface casing setting depth required to protect fresh water sands. Prepare pore pressure and true pressure versus depth plots.	Optimize the number and depths of protective casings. Optimize the size of the casing strings and liners.
Design casing.	Understand basic design principles (burst, collapse, tension in the pressure/temperature environment that the casing will encounter).	Design surface, intermediate and production casing/liner to maintain well integrity.	Design select optimal casing connections for hostile environments (HPT, H ₂ S, ash, etc.).
Maintain regulatory compliance.	Understand requirements to protect fresh water with surface casing setting depth/cement and requirements on directional programs to stay within lease/block boundaries.	Understand the process required to comply with regulatory requirements, (e.g., design an abandonment procedure to isolate zones per regulatory or that may cause flow, know what regulatory applications to prepare, and how to verify compliance).	Calculate emissions from rig operations (air pollutants from engine exhaust rates, H ₂ S, etc.).
Select the mud program.	Calculate the minimum mud weight required to balance formation pressure for each hole interval.	Design mud program to maintain well control considering casing programs and formation integrity. Select acceptable mud types. Specify mud properties (e.g., density and fluid loss requirements).	Optimize the cost of the mud system by altering the rheological nature of the mud system. Establish the critical minimum inhibition requirements.



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Exam Questions




- Created by licensed (by exam), practicing engineers
 - Each discipline has a subcommittee
 - Competency matrix “divvied up” to build database of problems – exam drawn from database
 - Both “breadth” and “depth” questions in database
 - Required to provide a “common” reference – this is *transitioning* to where the common reference is the set of Handbooks and the Reference Guide
 - Timed
 - Question designer states the time they think it will take
 - At least three others on the subcommittee provide their timings
 - Average is stored in the database
 - Questions are also reviewed by the whole committee for clarity before entry into the database
 - Once exam is created, committee reviews all questions for clarity, unnecessary duplication, difficulty and structure

Exam Questions




- Psychometrics – NCEES
 - Design of answers:
 - Correct answer is one of the choices
 - Other choices are errors that the designer thinks you will make i.e. the “most common mistakes”
 - There are a certain number of questions that “overlap” with previous exams – aids in the statistical analysis of questions
 - “Bad questions”
- After the exam
 - Some questions sent back to SPE Committee for review
 - Some questions thrown out
 - “Cut score” determined

Exam Preparation




- If you have time before the exam, take a prep course to “kick off” your studies
- Print out Competency Matrix and Exam Specs
- Use the materials from the course, the SPE “Guide” and “Sample Exam” for phrasing and makeup of questions (examples/go-bys)
- Slot the questions you see in the matrix
 - “Breadth” vs. “Depth”
 - Approximately 60%/40% breadth vs. depth on the exam
- Think of others or ask a friend in those areas you are weak to create similar, related, extension or derivative questions
- Review the SPE Handbook series for tables and “practices”

Exam Preparation




- Set aside an hour or so every day to work problems and review materials
- Become familiar with your references, tab key pages
- Assess your strengths and weaknesses
 - The discipline is very broad and there likely are areas you cannot hope to “learn” before the exam
- Focus on solving problems/organize your references in your areas of strength first
 - If you are an expert drilling engineer, solve the drilling problems first
 - But don’t spend a LOT of time on this – it is your STRENGTH
- Look through your materials and see if there are items in your weak areas where you *might* be able to do something to improve your chances in those areas (prep courses can help with this)
- Spend most of your time on your intermediate knowledge areas
- Note: this same strategy works for taking the exam as well!

Exam Preparation




- Limit your reference materials to trusted sources.....you can take in too many references and waste time sifting through them!
- The SPE Handbook series is a great reference, but overwhelming!
 - Volumes III Facilities and Construction Engineering and Volume IV Production Operations are the two I (Bob) recommend
- Bring your favorite texts:
 - *Reservoir Engineering Craft*, Hawkins & Terry or *Advanced Reservoir Engineering* by Ahmad & McKinney
 - *Well Testing* by John Lee
 - *Applied Drilling Engineering* by Bourgoyne
 - *Natural Gas Production Engineering* by Ikoku
 - *Production Operations* by Allen and Roberts or *Petroleum Production Systems* by Economides, et al.
 - An engineering economics text
 - A dictionary of oilfield terms
 - *Baker Packer Calculation Manual*
 - Lonestar Steel/Halliburton red book – casing tables
 - Schlumberger or other log interpretation chart book
 - GPSA data book and/or API Recommended Practices

The Exam




What are the questions like?

- Problems are offered in both SI units and U.S. units
- Each question is a multiple choice question with 4 possible answers.
- The questions can be short problems (some are longer!) involving design, analysis, or application; definitions or “word” problems; questions related to “standards”
- You have ~6 minutes to work each problem.
- Don’t expect to be able to work every problem.
- If you get stuck on a problem, leave it!
- Save the tougher problems for the end of the session and make educated guesses when crunch time comes.

Sample Questions



- The publication most closely associated with the design of a sucker rod pumping system is:
 - a. API RP11S
 - b. API RP11L
 - c. ANSI/API 25301985
 - d. AGA Report No. 3



Sample Questions



- Economics
 - Given an annual discount rate and convention (mid-year, end-of-year), investment, revenues and expenses, the present worth of the project is:
- Procedures
 - Given a scenario, which procedure would be used to execute the scenario
- PVT properties (couched as some other question compute OOIP, RF, etc)
 - Given Flash, Differential Liberation and Separator tests, determine the correct Rs or Bo values to use



Sample Questions



- A 10,000-ft string of 2 3/8-inch, 4.7-lb/ft tubing is stuck in the hole. After pulling tension into the string, the weight indicator reads 57,000 lb (10,000 lb over string weight), and 20 inches of tubing stretch is seen at the surface.
The depth (ft) at which the tubing is stuck is most nearly: :
 - a. 1,150
 - b. 1,600
 - c. 5,990
 - d. 6,520



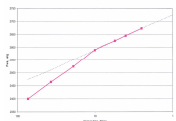
Sample Questions



- A well produced for 3 days at 522 STB/D then shut-in for a pressure build up test. The following additional information is known:

Bubble point pressure = 1,500 psi	Net pay = 18 ft
Wellbore radius = 0.40 ft	Oil viscosity = 2 cp
Total compressibility = 2.5×10^{-5}	Formation Volume Factor = 1.21 rb/STB
Permeability = 47 md	Horner plot slope = 135 psi/cycle
Flowing bottomhole pressure = 1,610 psi	
- Considering the above information and the figure provided (points are actual data), the skin value is most nearly:

- 2.6
 - 3.5
 - 5.1
 - 6.1



Exam plot is bigger!



Sample Questions



- A well has a proposed kick-off point of 12,000 ft MD (12,000 ft TVD) with 0 degrees of deviation and with a final proposed total depth of 13,500 ft MD (12,100 ft TVD) at 90 degrees of deviation. The 90 degrees of deviation was initially achieved at 12,157 ft MD. The directional drilling technique that most nearly addresses the desired wellbore trajectory is:
 - Short Radius
 - Medium Radius
 - Long Radius
 - Extended Reach



Sample Questions



- A commercial oil reservoir has recently been discovered. If water influx is present but ignored in early material balance calculations of original oil in place, the calculated value for OOIP would most likely be:
 - Too high
 - Too low
 - Correct
 - Independent of water influx



Webinars

Passing The Exam

What does it take to pass the exam?

- Preparation
- Patience
- Prayer!!!!

What does it REALLY take to pass the exam?

- Historically, a score of approximately 45 or more out of 80 questions right will give you a passing grade!

Webinars

Exam Preparation

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