UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV/DEC 2018

COURSE NO: PE 473
COURSE NAME: **OIL AND GAS PROJECT EVALUATION**
CLASS: **PE IV** TIME: 3 HOURS

Name: _____ Index Number:

SECTION A **ANSWER ALL THE QUESTIONS** **50 MARKS**

Read Questions 1-10 Carefully and Choose the Correct Letter, A or B

1. Cost recovery limit is the only true distinction between concessionary systems and PSC in terms of the mechanics of the two fiscal systems.
   A. True B. False

2. For mutually exclusive alternative, the decision maker can only select one alternative
   A. True B. False

3. Royalty comes first out of the gross revenue such that gross revenue less royalty equals net profit.
   A. True B. False

4. Past costs that have not been recovered are called sunk cost.
   A. True B. False

5. When debt (loan) is amortized in periodic fixed installments, the principal component of installment declines over time.
   A. True B. False

6. Tangible items are items associated with the installation or construction of intangible assets.
   A. True B. False

7. Sensitivity analysis can be performed on any variables.
   A. True B. False

8. Overriding royalty is payment made to someone other than the mineral owner in form of a stipulated share of future production for an agreed compensation.
   A. True B. False

9. Given a principal amount of $10,000 to be invested for 12 months, it is better to invest in a scheme that offers 12% annual compound interest than investing in a scheme that earns 12% simple interest.
   A. True B. False

10. A decision node may be followed by another decision node.

A. True B. False

Choose the Correct Letter, A, B, C or D For Questions 11 – 50

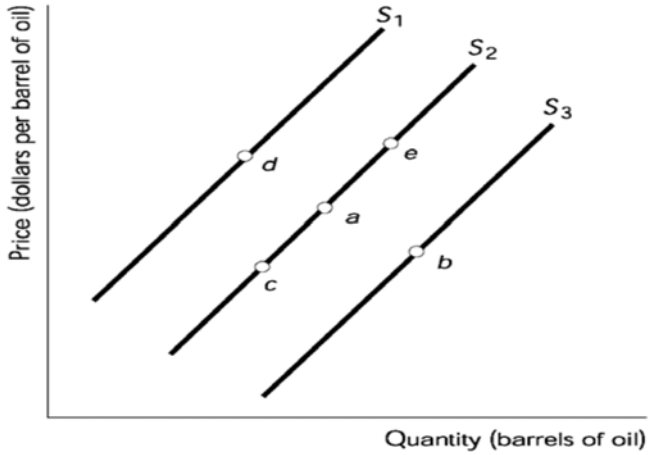


Figure 1

11. In figure 1, an increase in the quantity of oil supplied but NOT in the supply of oil is shown by a movement from
    A. point *a* to point *c* B. point *a* to point *b*
    C. point *a* to point *e* D. point *a* to point *d*

12. In figure 1, an increase in the supply of oil would result in a movement from
    A. point *a* to point *d* B. point *a* to point *e*
    C. point *a* to point *b* D. point *a* to point *c*

13. A price below the equilibrium price results in
    A. a further price fall B. a shortage
    C. excess supply D. a surplus

14. An investment has the following cash flows. Should the project be accepted if it has been assigned a required return of 14 percent? Why or why not?

Year	0	1	2	3
Cash Flow ($)	-30 000	8 400	13 900	18 600

    A. No; the IRR exceeds the required return by about 1.08 percent
    B. No; the IRR is less than the required return by about 0.97 percent
    C. Yes; the IRR exceeds the required return by about 1.08 percent
    D. Yes; the IRR is less than the required return by about 0.97 percent

15. A shortage causes the
    A. supply curve to shift rightward B. price to rise
    C. price to fall D. demand curve to shift leftward

16. The internal rate of return (IRR):
    I. rule states that a project is acceptable when the IRR exceeds the required rate of return.
    II. ignores the initial investment in a project.
    III. is the rate that causes the net present value of a project to equal zero.
    IV. can effectively be used to analyze all investment scenarios.

A. I and III only
B. II and IV only
C. I and II only
D. II, III, and IV only

17. Suppose people buy more of good 1 when the price of good 2 falls. These goods are
A. substitutes.
B. inferior.
C. normal.
D. complements

18. What is the net present value of a project with the following cash flows if the required rate of return is 14 percent?

Year	0	1	2	3
Cash flow	-33 680	10 796	22 308	4 170

A. -$5 450.09
B. -$4 229.91
C. -$306.18
D. $4 729.09

19. The demand for a good increases when the price of a substitute _____ and also increases when the price of a complement _____.
A. falls; falls
B. rises; falls
C. rises; rises
D. falls; rises

20. When computing the net present value of a project, the net amount received from salvaging the fixed assets used in the project is:
A. subtracted from the initial cash outlay.
B. included in the final cash flow of the project.
C. excluded from the analysis since it occurs only when the project ends.
D. subtracted from the original cost of the assets.

21. Spider chart:
I. Shows the difference between the minimum and maximum forecast values for all the variable tested.
II. The slopes of the spider graph lines indicate the direction of impact on the forecast value of change in variable.
III. The steeper the slope of the spider graph line the smaller the impact on forecast values of that variable.
A. I only
B. II only
C. I &II only
D. II & III only

22. Five hundred dollars is deposited into an account that pays 5% interest compounded continuously. If the money remains in the account for three years the account balance is nearest to
A. $525
B. $578
C. $581
D. $598

23. Sensitivity analysis:
I. can be performed on any variable
II. provides information on what may happen if forecast assumptions are varied one by one

III. sensitivity charts show the influence each assumptions has on a particular forecast output

A. II only
B. I &II only
C. II & III only
D. I, II & III

24. Concessionary fiscal system:

I. Also called royalty/tax (R/T) systems.
II. Contractor bears all risk and rewards.
III. Host government's reward is a function of production and price.

A. II only
B. I &II only
C. II & III only
D. I, II & III

25. Royalty:

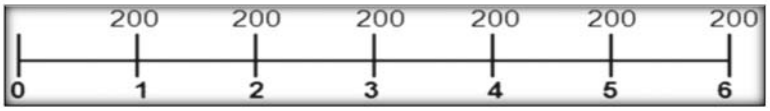
I. Royalty can be used as a bid parameter.
II. Royalty is normally a percentage of net revenue and amount of production.
III. It can be paid in cash or kind

A. II only
B. I &III only
C. II & III only
D. I, II & III

26. Which one of the following does measure risk?

A. Coefficient of variation
B. Standard deviation
C. Expected value
D. All of the above

27. Assuming an interest rate of 8% per year, find the present value of the following stream.



A. $925
B. $999
C. $825
D. $888

28. The royalty and tax in a concessionary system is based on the R-factor of the contractor. What is the R-factor of the contractor if his cumulative revenue and cumulative cost at a certain point in time is $600 000 and $350 000, respectively?

A. 1.71
B. 0.58
C. 1.43
D. 1.67

29. A situation in which a decision maker knows all of the possible outcomes of a decision and also knows the probability associated with each outcome is referred to as

A certainty
B. risk
C. uncertainty
D. strategy

30. What is the future value of $100 after five years at an interest rate of 10% per year compounded monthly?

A. $161.05 B. $164.53
C. $151.05 D. $174.53

31. Relationship between annual nominal rate of interest and annual effective rate of interest, if frequency of compounding is greater than one
A Effective rate > Nominal rate B. Effective rate < Nominal rate
C. Effective rate = Nominal rate D. None of the above

32. Which project will be selected if $IRR_{(B-A)}$ = 8%, $IRR_{(C-B)}$ = 20%, and $IRR_{(C-A)}$ = 16%? The desired rate of return is 10%.
A. Project A B. Project B
C. Project C D. None of the above

33. Which of the following Excel financial functions is used to calculate the correct NPV in Table 1?
A. =NPV(B1,B3:E3)+A3 B. =NPV(B1,A3:E3)
C.=XNPV(B1,A3:E3,A2:E2) D.=NPV(B1,C3:E3)+A3+B3

Table 1: Cash Flow

	A	B	C	D	E
1	Discount Rate	8%			
2	**1**	**2**	**3**	**4**	**5**
3	-1,800	-4,200	3,000	3,000	3,000

34. .....are risk takers who have no interest in ownership of crude but are willing to assume price risks in hopes of larger profits.
A. Speculators B. Brokers
C. Hedgers D. Operators

Table 2

Prospect:		A
Well Completion Cost		***$120 000***
Dry Hole Cost		***$100 000***
Possible Outcome	**Probability**	**NPV**
Dry Hole	0.25	(100 000.00)
100 MBbls	0.30	25 000.00
200 MBbls	0.25	150 000.00
300 MBbls	0.15	250 000.00
400 MBbls	0.05	350 000.00

35. From ***Table 2***, what is the Expected Monetary Value (EMV)?
A. 65 000 B. 75 000
C. 85 000 D. 125 000

36. What is the Expected Profit Index (EPI) in ***Table 2***?
A. 0.34 B. 0.35
C. 0.64 D. 0.65

37. Suppose that the heat exchanger has a depreciable cost of $50 000 and will

last for 25 million bbl. Calculate the annual depreciation cost of the heat exchanger if it is processing 600 000 bbl yearly.

A. $1 500 B. $1 200
C. $400 D. $500

38. The future worth (in year 8) of $10 000 deposited at the end of year 3, $10 000 deposited at the end of year 5, and $10 000 deposited at the end of year 8 at an interest rate of 12% per year is closest to

A. $32 100 B. $39 300
C. $41 670 D. $46 200

Use this data to answer questions 39-41: Given that a well has declined from 120 stb/day to 112 stb/day during a one-month period, use the exponential decline model to perform the following tasks:

39. What is the nominal decline rate per month?

A. 0.067/month B. 0.069/month
C. 0.076/month D. 0.096/month

40. What is production rate after 11 more months?

A. 52.21 BOPD B. 54.54 BOPD
C. 48.30 BOPD D. 125 BOPD

41. What is the cumulative oil produced after one year?

A. 29 732.42 STB B. 81.45 STB
C. 39 469.12 STB D. 19 324 STB

42. The capital needed to operate an oil field or a refinery as well as the facilities associated with them is known as

A. Fixed Capital B. Working Capital
C. Non depreciable Capital D. None of the above

43. Which of the following is not a tangible asset?

A. Wellheads B. Pumping equipment
C. Tubular D. Equipment rentals

44. The value of an asset or equipment as it appears in the official accounting record of an oil organisation is known as the

A. Salvage value B. Market value
C. Book value D. Account Assets

45. A contractual agreement with an owner who holds a working interest in an oil and gas lease to assign all or part of that interest to another party in exchange for fulfilling contractually specified conditions is referred as

A. Overriding royalties B. Joint venture
C. Farmout D. Production payment

46. Which of the following statements about the difference between CAPEX and OPEX is true?

A. CAPEX occurs only before first oil is produced, after which all expenditure is OPEX.
B. CAPEX is discounted at a different rate to OPEX.

C. CAPEX relates to the construction of a system of production, whereas OPEX relates to the operation and maintenance of these systems.
D. CAPEX can be always deducted from the tax liability, whereas OPEX can only be deducted after first oil.

47. Which of the following is not a cash flow item to be considered in a cash flow evaluation model?
A. Cost of a seismic test. B. Depreciation of the parent platform.
C. Platform maintenance expenses. D. None of the above.

48. How long would it take $800 to double in value if the interest rate were 4.2% per compounded annually?
A. 15.8 years B. 14.6 years
C. 12.4 years D. 16.8 years

49. You invest $1 500 at the end of year one and $ 2 000 at the end of second year and $5 000 each year from third to tenth. Find the present value of stream at discount rate of 10%
A. $ 25 062 B. $ 24 712
B. $ 26 502 D. $ 24 242

50. The relation between effective annual rate of interest (E) and nominal rate of interest (r) is best represented by;
A. $E = (1 + r/m)^{mn} - 1$ B. $E = (1 + r/m)^{m} - 1$
C. $E = (1 + re/m) - 1$ D. None of the above

QUESTION 1

A. A small independent oil company is considering investing some money in a drilling prospect. Two prospects are under consideration out of which only one will be drilled this year. The initial drilling and completion costs and net revenues (revenues – expenses) are provided in Table 3.

Table 3: Initial Drilling and Completion Costs and Net Revenues

	Investment A	Investment B
Initial investment	–$800 000	-$1500 000
Net revenue, years 2 to 5	$200 000	$350 000
Net revenue, years 6 to 10	$250 000	$250 000

i. Compute the payback period for each investment.

ii. Based on NPV analysis, which prospect should be selected if the company's minimum acceptable rate of return is 12%?

[20 Marks]

B. Explain the differences and similarities between net present value (NPV) and the profitability index (PI).

[5 Marks]

QUESTION 2

A. Enumerate any five features which distinguish Exploration and Production (E & P) investment project from other investment projects.

[5 Marks]

B. An oil company has installed an offshore production facility for $10 million in year 1. The Gross revenue from a field over its economic life is $500 million. The capital and operating costs over the project life is $200 million. The contractor pays $129 million in royalties and taxes to the host government. Calculate the government and contractor takes for this concessionary arrangement. **[10 Marks]**

C. An acid injection unit had an original cost of $17 000 with a service life of 5 years and a salvage value of $2 000. Calculate the annual depreciation costs and the book value at the beginning of the year for this unit using 200% declining balance depreciation (DBD). **[10 Marks]**

QUESTION 3

A. Explain the following terms: **[10 Marks]**

(i) Effective interest rate (iii) Market system

(ii) Profit oil value (iv) Proved reserves (v) Salvage

B. An oil and gas company is planning to drill a well. Geologist and engineers estimate that there is a 65% chance that there will be a producer and a 35% chance that there will be a dry hole. If the well is successful, it is estimated that there is a 60% chance that it will have reserves of 30 000 barrels, a 30% chance of 60 000 barrels and a 10% chance of 90 000 barrels. The dry hole cost is $65 000 and the NPV corresponding each reserve value is $60 000, $120 000 or $180 000 respectively. Using decision tree, should the company drill?

[15 Marks]

Examiners: *Dr Eric Broni-Bediako/Dr Richard Amorin*