

Total No. of Questions : 8]

SEAT No. :

P1105

[4659]-284

[Total No. of Pages : 7

B.E. (Petroleum Engineering)

a - PETROLEUM ECONOMICS

(Elective - IV) (2008 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate books.*
- 2) Use of graph paper is allowed.*
- 3) Figures to the right indicate marks.*
- 4) Assume additional data, if necessary.*

SECTION - I

Q1) a) Answer the following in brief (Any Five): **[15]**

- i) P 10, P 50 and P 90 in Reserves Estimation.
- ii) Trade movement for oil.
- iii) Oil differential.
- iv) UN framework classification “the EFG System”.
- v) Peak oil theory and Hubert curves.
- vi) Incremental Analysis.
- vii) Standard practices for reporting of reserves.

b) Plot the information on suitable graph and calculate the time required to decline to economic limit of 1000 BOPD. **[10]**

Month	Bbl./month
1	5400
2	5000
3	4800
4	4100
5	3900
6	3600
7	3300
8	3100

P.T.O.

Month	Bbl./month
9	2900
10	2650
11	2400
12	2350
13	2160
14	2050
15	1910
16	1790

Assuming recovered reserves are 24% of OOIP, calculate OOIP. How much is still producible taking into consideration economic limit.

OR

Q2) a) An oil property is estimated to have total reserves amounting to be 800,000 bbl. The performance prediction trend has shown a graph of an initial rate of 400 BOPD to an economic limit of 30 BOPD. Calculate the total time on production assuming successively the following values of parameter b : (a) $b = 0$, (b) $b = 0.5$ and (c) $b = 1.0\%$ [10]

b) What is reserves auditing? State the norms given by SPE/AAPG/SEC for auditing of reserves. What are the common errors committed in the calculation of oil and gas reserves? [15]

Q3) a) Explain with the help of hypothetical cash flow diagram, various concepts used in the mathematical methods of profitability evaluation. [10]

b) Assume following data: [15]

Current oil price of brand oil in international market is \$89.60. It is anticipated that the price will increase at a rate of 5.35% per year for first four years and then drop to an annual rate of 4.25% thereafter for next four years.

The producible oil has lower API than that brand oil along with higher sulphur and TAN content, thus leading to a price differential of 11.5% with respect to the oil price quoted above.

Develop a forecast for oil price each for brand oil and the oil under consideration for a span of eight years.

OR

- Q4) a)** Write in brief on any two of the following: **[10]**
- i) Oil Price elasticity.
 - ii) Tangible and In tangible costs.
 - iii) Sensitivity Analysis.
 - iv) NPV and DCFROR.
- b) The company has opportunity to invest in three mutually exclusive alternatives details of which are given below. The company's cost of capital is 15%.

Give your decision on NPV, DCFROR and PVI. **[15]**

	A	B
Initial Investment	\$5,00,000	\$ 8,00,000
Annual revenue	\$ 1,00,000	\$ 1,50,000
Annual expenses	\$ 10,000	\$ 15,000
Service life	10 years	10 years
Salvage value	\$ 50,000	\$ 75,000

SECTION - II

- Q5) a)** A wildcat well is being considered in a relatively unknown but highly promising area. Available data indicates that three separate horizons independent from one another would most possibly be producing.

Create a decision tree for the success and failure for the horizons (X, Y, and Z) to illustrate the probability of occurrence of these events with possible outcome of events. **[10]**

- b) Initial cost of the completely installed reactor is \$ 20,000 and its salvage value towards the completion of useful life is \$ 2000. Service life of the reactor is 6 years. Calculate its depreciation using **Straight Line Depreciation (SLD), and Double Declining Balance (DDB) methods**. Prepare a plot of book value against number of years and compare the results obtained with different methods in your own words. **[15]**

OR

[4659]-284

3

Q6) a) Explain any two of the following: [10]

- i) Depreciation and Depletion,
- ii) Meaning and interpretation of EMV.
- iii) Reserves accretion and discovery of field size scenario in past 20 years.
- iv) Profitability in projects and equivalence of field size in different countries within the framework of Production sharing contract.

b) Proposal of buying drilling rights for a block of good potential are under consideration. Following are the details of the same. [15]

- ✓ \$ 5 MM is required to secure drilling rights.
- ✓ Seismic coverage is available at \$ 2 MM.
- ✓ Two possibilities are anticipated, a large reserve with a NPV of \$ 75 MM and a smaller marginal worth a NPV of \$ 30 MM excluding development costs.

Two exploration strategies are under consideration:

- ✓ Drill exploratory wells on the basis of available geological knowledge.
- ✓ Spend on seismic and take decision after confirmation or drop acreage,
- ✓ It is also possible to drill second exploratory well if first well is dry.

Company management is uncertain about the prospect and has thus given a task for evaluation. Here are some details:

- ✓ Drilling a wildcat is \$8mm each.
- ✓ If second well is dry the field has to be abandoned.

Following is the probability of occurrence of different events:

Outcome	One wildcat Drilled on Geological control	Second wildcat drilled on geological control	One Wildcat drilled after obtaining Seismic	Second Wildcat Drilled after obtaining Seismic
Large Field	0.05	0.075	0.15	0.20
Marginal field	0.05	0.075	0.15	0.20
Dry Hole	0.90	0.85	0.70	0.60

Construct a suitable decision tree taking into consideration different possibilities and data available. Solve the tree using conventional approach and give solution with proper justification. Show calculations at every step.

Q7) a) You are given production data for economic analysis: **[20]**

Year	BOPD
1	1050
2	1170
3	1305
4	1455
5	1761
6	1761
7	1761
8	1542
9	1351
10	1183
11	1037
12	908
13	795
14	697
15	610

Following are the assumptions for the analysis:

- ✓ Oil price is \$ 85. Initial Investment is \$ 100 MM and production cost is \$ 4.00/bbl.
- ✓ Royalty is 10% on annual production, to be deducted from gross revenue.
- ✓ Rate of return is 10%.
- ✓ Cost recovery is 80% and is allowed to deduce with the commencement of commercial production. The unrecovered cost is allowed to carry forward to next year.
- ✓ Profit petroleum is to be shared between government and contractor @ 60% and 40% respectively.
- ✓ Contractor is entitled to pay 30% income tax on profit.

Prepare a tabular form giving details of annual production, cumulative production, gross cash flow, royalty, net cash flow, cost recovery, recovered cost, profit petroleum, government share and contractor share, NPV for contractor BFIT and AFIT.

How is one barrel distributed?

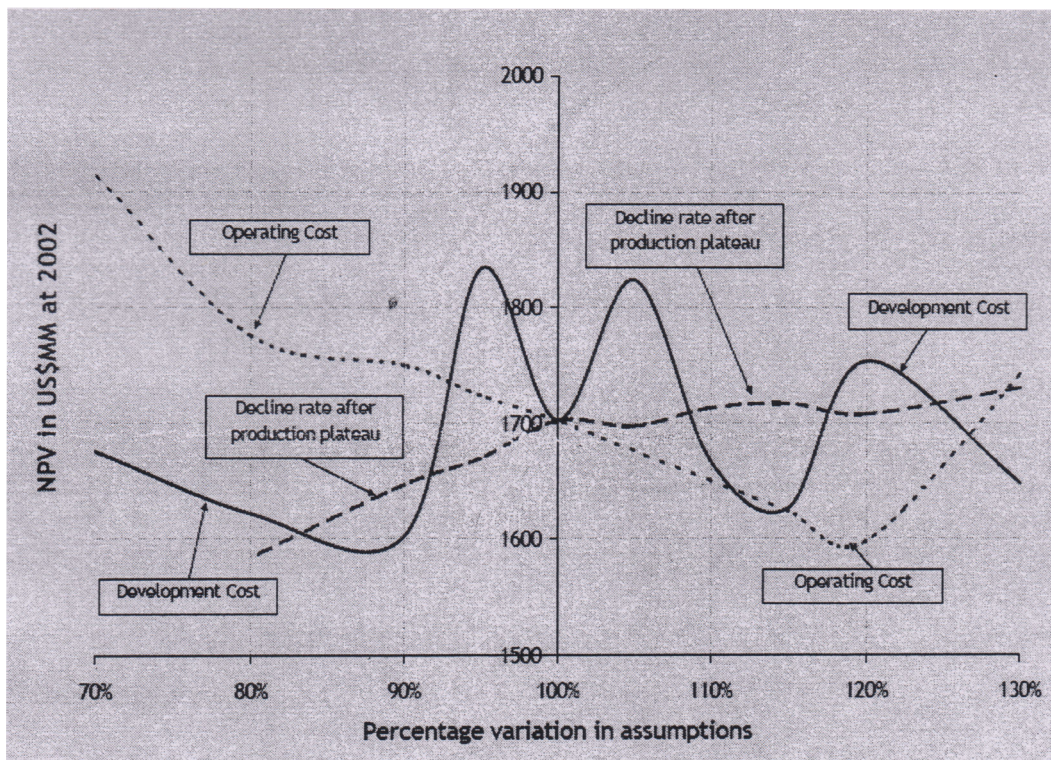
- b) An oil company has mapped a prospect and concluded that the resources may be as high as 50 million barrels and the probability of success (POS) is estimated to be 10%. **[5]**

The data acquired, the interpretations and the cost of the exploration well will amount to 25 million USD. If a discovery is made, the NPV will be 100 million USD.

- i) Calculate the expected monetary value.
- ii) Find the break even POS.

OR

- Q8) a) Refer to the following diagram to analyze sensitivity of different parameters in case of decline rate of oil after production plateau. Describe the diagram and prepare a table showing effects of production decline with comments. [10]



- b) Write a detailed note on Petroleum accounting system. [15]

