1) A company needs to decide whether to dig for oil in a field. Estimates based on preliminary knowledge available show the probability of finding oil $P(O)$ in the field to be 0.50. In order to be more assured, the company conducts a survey. If there is oil, the survey becomes favorable with a probability of 0.7. If there is no oil, the survey becomes unfavorable with a probability of 0.8 (See the figure below):

![Survey Diagram]

From the Figure above, probability of finding oil given the survey favorable $P(O|SF)$ will be (SF: Survey Favorable):

i. Prior probability
ii. **Posterior probability**
iii. Joint probability
iv. Total or unconditional probability

2) The probability of survey favorable (SF) given that there is oil, i.e. $P(SF|O)$ will be:

i. Prior probability
ii. **Posterior probability**
iii. Joint probability
iv. **Conditional probability**

3) The value of total or unconditional probability $P(SF)$ will be equal to (SF: Survey Favorable):

i. 0.10
ii. 0.35
iii. **0.45**
iv. 0.55
4) Posterior Probability in the Bayesian Analysis, is a type of conditional probability. This is:
   i. True
   ii. False
   iii. Not certain

5) All Payoff Matrices can be represented by an equivalent Decision Tree. This is:
   i. True
   ii. False
   iii. Not certain

6) In a decision tree, a state-of-nature node will be shown with the help of a:
   i. Square
   ii. Circle
   iii. Triangle
   iv. Not sure

7) In Bayesian analysis, Joint probabilities are obtained by multiplying prior probabilities with appropriate conditional probabilities:
   i. True
   ii. False
   iii. Not certain

8) For the decision tree given below, what will be the right decision for a decision maker who operates with the expected value criterion?

   i. Construct Large Plant
   ii. Construct Small Plant
   iii. Do Nothing
9) For the data given below, please find the right decision for the expected value decision rule.

<table>
<thead>
<tr>
<th>State of Nature</th>
<th>Smooth – No Risk</th>
<th>Troublesome – High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternatives</td>
<td>Smooth – No Risk</td>
<td>Troublesome – High Risk</td>
</tr>
<tr>
<td>Restructure Business</td>
<td>1000</td>
<td>– 250</td>
</tr>
<tr>
<td>Normal Business</td>
<td>300</td>
<td>200</td>
</tr>
<tr>
<td>Prior Probability</td>
<td>0.4</td>
<td>0.6</td>
</tr>
</tbody>
</table>

i. Normal Business  
ii. **Restructure Business**  
iii. Any one the above

10) For the decision tree given below, what will be the right decision for a decision maker who operates with the expected value criterion?

i. Construct Large Plant  
ii. **Construct Small Plant**  
iii. Do Nothing

11) For decision making with experimentation, the experimentation is done at a cost but the cost does not affect the payoffs of the decision alternatives

i. True  
ii. **False**  
iii. Only some of the time

12) A company needs to decide whether to dig for oil in a land or to sell it off. Initial payoffs are available. Now the company can go for a survey for availability of oil in the land. Conducting the survey is experimentation. The survey modifies the prior probabilities to a set of posterior probabilities.

Now, the first decision is whether to go for the survey. The second decision is whether to dig for oil or to sell the land off. For this decision making situation with experimentation:

i. The first decision is dependent on the outcome of the second decision  
ii. The two decisions are independent
iii. The second decision is dependent of the outcome of the first decision
iv. Both the decisions are dependent on each other

13) A company needs to decide whether to dig for oil in a land or to sell it off. Initial payoffs are available. Now the company can go for a survey for availability of oil in the land. Conducting the survey is experimentation. The survey modifies the prior probabilities to a set of posterior probabilities.

Now, the first decision is whether to go for the survey. The second decision is whether to dig for oil or to sell the land off. For this decision making situation with experimentation:

i. When survey is favorable, Posterior probability of oil to be found will be lower than its prior probability
ii. When survey is favorable, Posterior probability of oil to be found will be higher than its prior probability
iii. When survey is favorable, Posterior probability of oil to be found will be equal to its prior probability
iv. Nothing can be predicted

14) Expected Value of Sample Information (EVSI) is given by:

i. Expected Value of Best Decision with Sample Information – Expected Value of Best Decision without Sample information
ii. Expected Value of Best Decision with Sample Information – Expected Value of Best Decision without Sample information – Cost of obtaining Sample Information
iii. Expected Value of Best Decision with Sample Information – Expected Value of Best Decision without Sample information + Cost of obtaining Sample Information
iv. Cost of obtaining Sample Information

15) In a decision making situation with experimentation, Expected Value of Best Decision without Sample Information is Rs. 20,000. With sample information, the expected value of Best Decision goes up to Rs. 27,500. The sample information is available at a cost of Rs. 4,500. Expected Value of Sample Information (EVSI) is given by:

i. Rs. 3,000
ii. Rs. 4,500
iii. Rs. 7,500
iv. Rs. 12000
**Explanations**

3. \( P(\text{SF}) = P(\text{SF}|\text{Oil}) \cdot P(\text{Oil}) + P(\text{SF}|\text{No Oil}) \cdot P(\text{No Oil}) \)
   \[ = 0.7 \cdot 0.5 + 0.2 \cdot 0.5 \]
   \[ = 0.35 + 0.10 \]
   \[ = 0.45 \]

8. Payoff for constructing large plant = \(0.6 \cdot 200,000 + 0.4 \cdot (-120,000)\)
   \[= 120,000 - 48,000\]
   \[= 72,000 (\text{$})\]

Payoff for constructing small plant = \(0.6 \cdot 100,000 + 0.4 \cdot (-40,000)\)
\[= 60,000 - 16,000\]
\[= 44,000 (\text{$})\]

Payoff for ‘do nothing’ = 0

Therefore, the decision maker will choose ‘Constructing Large Plant’.

9.

<table>
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<th>Expected Payoff</th>
</tr>
</thead>
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<tr>
<td></td>
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<td>0.4</td>
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</tr>
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</table>

Therefore, decision is ‘Restructure Business’

10. Payoff for constructing large plant = \(0.3 \cdot 200,000 + 0.7 \cdot (-120,000)\)
   \[= 60,000 - 84,000\]
   \[= -24,000 (\text{$})\]

Payoff for constructing small plant = \(0.3 \cdot 100,000 + 0.7 \cdot (-40,000)\)
\[= 30,000 - 28,000\]
\[= 2,000 (\text{$})\]

Payoff for ‘do nothing’ = 0
Therefore, the decision maker will choose ‘Constructing Small Plant’.

15. Cost of sample information is deducted from payoff, while calculating expected payoff with sample information. Therefore, we must add the cost of information with the additional payoff due to sample information.
So, expected value of sample information (EVSI) = 27,500 – 20,000 + 4,500 = 12,000 (Rs)