

Name:

Academic No:

**Writ your name and academic no. on the question paper Answer All Questions in the same paper**

**Q (1):**

(a) Chose [ $\checkmark$ ] if agree with the following statement or [ $\times$ ] if you don't.

Decision making under risk is the most is the most common situation in real world. [ ]

(b) An investment company wanted to establish a new business. They have studied the market and found that there are four business attractive business areas, namely agriculture, manufacturing, construction and education. There are three probabilities for economic growth which are good, moderate and poor. For each economic growth they have found the return and loses as shown in the Decision table below:

**Decision table for Q (1)**

Business areas	State of the nature		
	Good growth.	Moderate growth	Poor growth
Agriculture	100,000	-65,000	70,000
Manufacturing,	80,000	-20,000	30,000
Construction	250,000	-120,000	95,000
Education	60,000	0	10,000

**(c) Fill in the following solution tables:**

**(i) Solution for Q (1) using Maximax**

Business areas	State of the nature			
	Good growth.	Moderate growth	Poor growth	Solution value
Agriculture	100,000	-65,000	70,000	100,000
Manufacturing,	80,000	-20,000	30,000	
Construction	250,000	-120,000	95,000	
Education	60,000	0	10,000	

The best decision is : - - - - -

**(ii) Solution for Q (1) using Equally Likely**

Business areas	State of the nature			
	Good growth.	Moderate growth	Poor growth	Solution value
Agriculture	100,000	-65,000	70,000	
Manufacturing,	80,000	-20,000	30,000	45,000
Construction	250,000	-120,000	95,000	
Education	60,000	0	10,000	

The best decision is : - - - - -

**(iii) Solution for Q (1) Criterion realism with realistic criteria ( $\alpha = 0.7$ )**

Business areas	State of the nature			
	Good growth.	Moderate growth	Poor growth	Solution value
Agriculture	100,000	-65,000	70,000	
Manufacturing,	80,000	-20,000	30,000	
Construction	250,000	-120,000	95,000	
Education	60,000	0	10,000	4,200

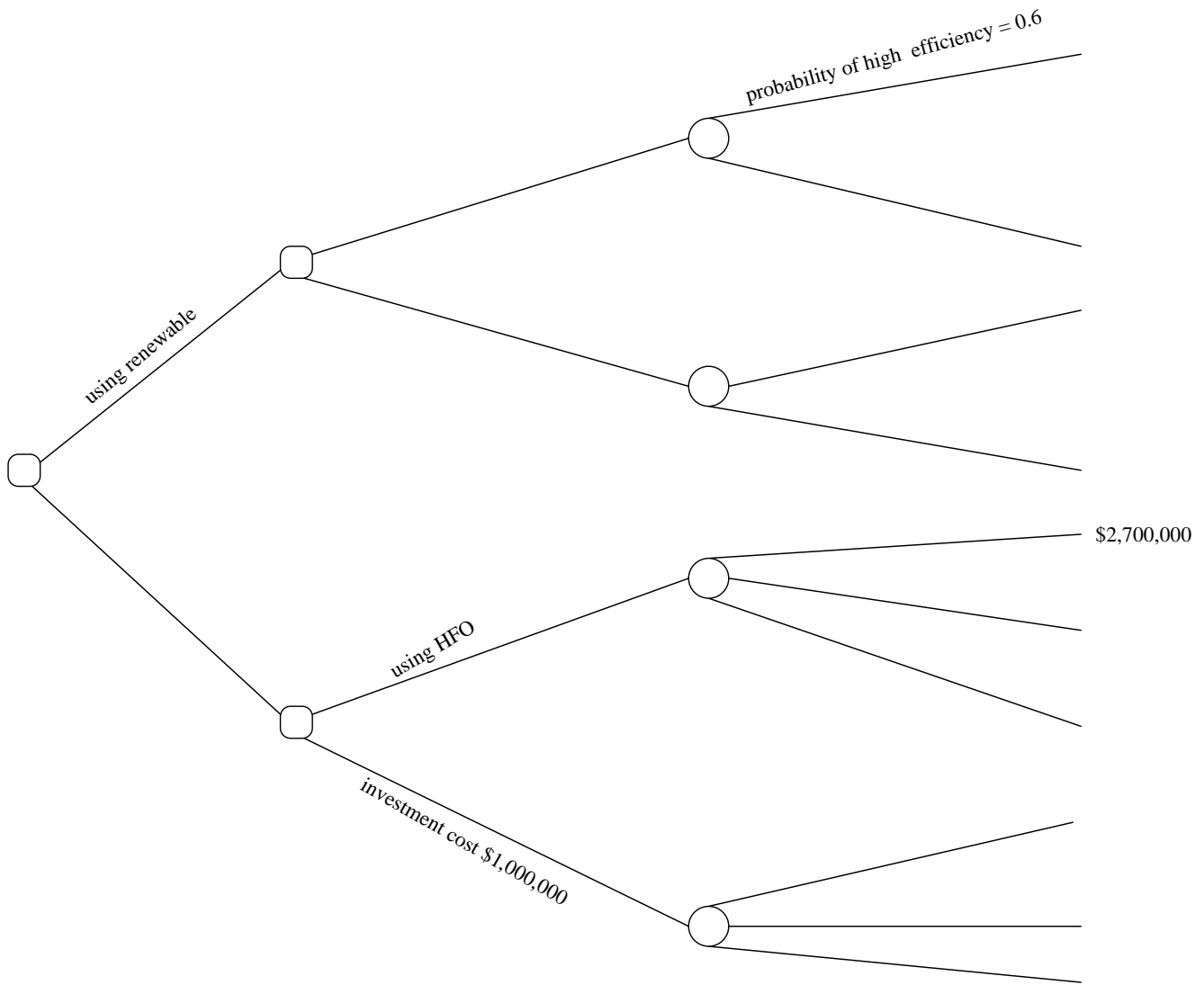
The best decision is : - - - - -

### Q (2):

A decision has to be made about using renewable source or fossil fuel to generate electricity for a small city. For using renewable source solar or wind could be used, an investment of \$2,000,000 for using solar will be needed, \$1,600,000 for using wind. Depending on the improvement on the efficiency of solar system, the solar system could return \$9,000,000 or \$900,000 depending on high and low improvement in efficiency respectively. The probability of high and low improvement in solar system efficiency is 0.6 and 0.4 respectively. Using wind could return \$7,000,000 or \$500,000 and for high and low improvement in wind system efficiency respectively. The probability of high and low improvement in wind system efficiency is 0.3 and 0.7 respectively.

For using fossil fuel the options will be to use Heavy Fuel Oil (HFO) or coal, an investment of \$1,000,000 for using HFO will be needed and \$1,200,000 for using coal. If coal is going to be used a return of 3,500,000 USD, 1,950,000 USD or 100,000 could be made for low, moderate or high changes in coal price respectively. The probability of low, moderate or high changes in coal price is 0.5, 0.4 and 0.1 respectively. If HFO is going to be used a return of 2,700,000 USD, 1,800,000 USD or 600,000 could be made for low, moderate or high changes in coal price respectively. The probability of low, moderate or high changes in coal price is 0.4, 0.4 and 0.2 respectively.

(b) Fill in all needed details in Decision Tree Fig. Q2 below and write the decision that you think is better to take.



**Q (2) Decision Tree**

**Q (3):**

**For the standard form given below:**

$$Z - 2 X_1 - 3 X_2 = 0$$

**Subject to**

$$X_1 + 2 X_2 + S_1 = 10$$

$$X_1 + X_2 + S_2 = 2$$

$$X_1, X_2, S_1, S_2 \geq 0$$

**(a) Complete the first simplex table (Basic Feasible Solution) below:**

<b>Basic Variables</b>	<b>X1</b>	<b>X2</b>	<b>S1</b>	<b>S2</b>	<b>Constant</b>
S1	1		1		10
S2	1	1	0		
Z				0	

(b) Entering variable is \_ \_ \_ \_

(c) Leaving variable is \_ \_ \_ \_

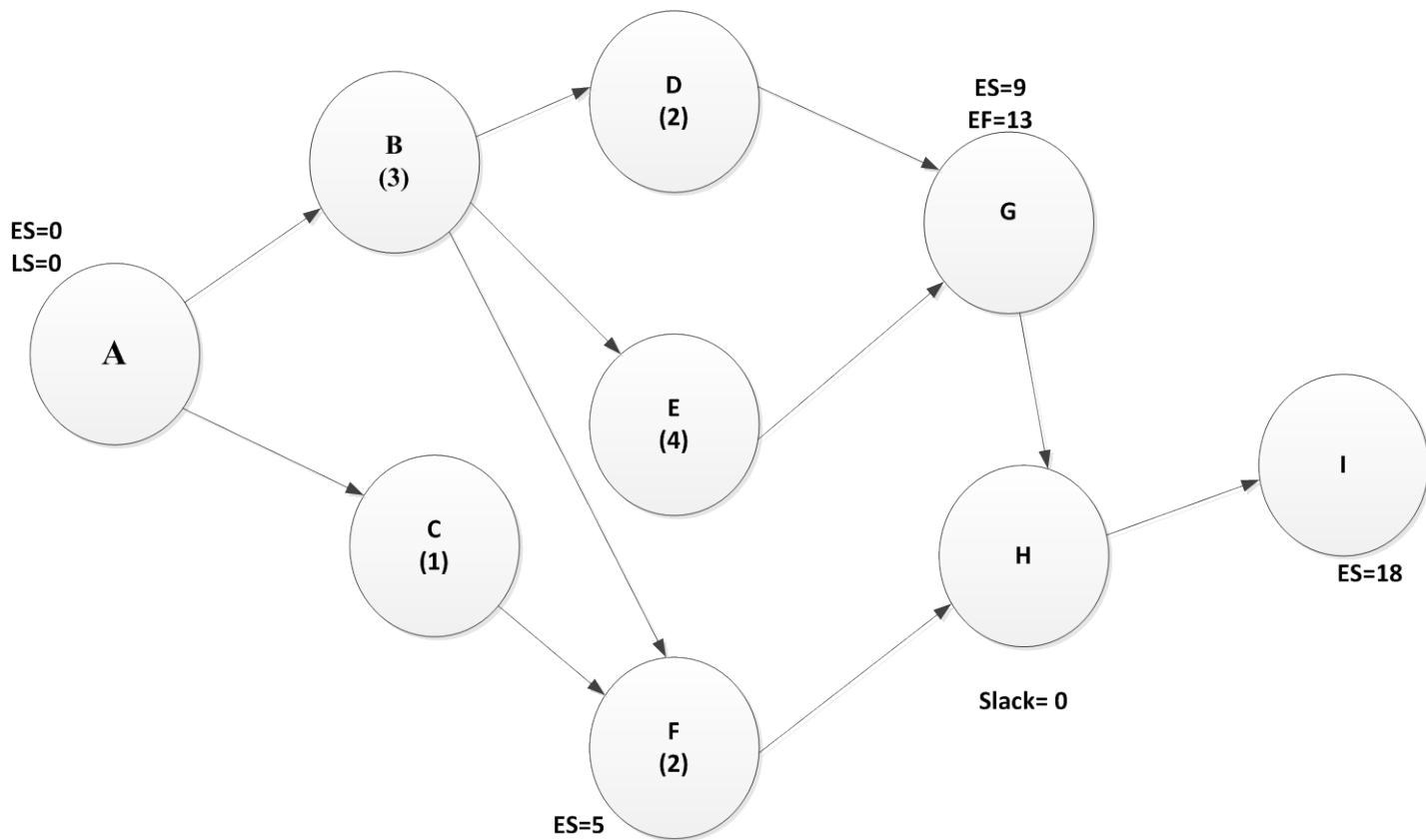
(d) Pivot element is \_ \_ \_ \_

(e) Chose [✓] if agree with the following statement or [×] if you don't.  
This problem cannot be solved by graphic method [ ].

**Q (4):**

**Fig. Q (4) below shows an AON diagram for a project where duration is months. If the probability of completing the project in 19 weeks is 100%, find the following:**

- (a) The critical path.**
- (b) Slacks for all noncritical paths.**
- (c) The activity with the smallest slack.**



**Fig Q(4): An AON diagram for a project**