Q1(a)
From the summary output, the regression equation is
Y = 627.6459X + 853.2918.
When X = 52, Y = 627.6459X+853.2918 = 33490.88.
A rough 95% confidence/prediction interval would be [Y - 2 Se, Y + 2 Se] = [-1980.66, 68961.84], where Se = 17735.47843 is the standard error from the summary output.
Hence a likely range of values for the operation cost with a 95% confidence/prediction level would be approximately [0, £68962] (as negative value cannot exist for operation cost) if one outlet sells 52 televisions in a month.

Q1(b) when X = 70, Y = 627.6459X + 853.2918 = 44788.50785
A rough 95% confidence/prediction interval would be [9317.545, 80259.46471]. A rough 99% confidence/prediction interval and 95% confidence interval does not contain £90,000. Thus, with the 95% confidence level, we think the operation cost in this outlet is significantly higher than a normal range of the operation cost compared with all other outlets of the retailer.

Q1(c) The slope of this regression equation is significantly different from zero as we can see that a 99% confidence interval does not contain zero (it can also be seen from the very small p-value). If the answer were no, i.e., the slope of this regression equation is not significantly different from zero at a certain, say 95%, confidence level, then we can think that this independent variable (the number of units sold) may not be a main driver for the dependent variable (the monthly operation cost) and therefore we should take this independent variable out of the regression equation.

Q2 (a) The busiest step with highest utilisation is the bottleneck or the step that limits the capacity of the whole step is the bottleneck
The question can be approached from the following options:
Option 1: Assuming that the input to the process is ‘x’ and given that x<90 or x=90, then:
Blending = 0.1X
Roasting = (0.1 X) x 0.2 = 0.02X
Grinding & Packing = 0.02X x 0.15 = 0.003 X
Blending is the bottleneck as it results in the underutilisation of the whole process
Option 2: Finding the effective capacity of the process by considering the waste in each step.
Blending = 90 x 0.1 = 9 t/hr
Roasting = 9 x 0.2 = 1.8 t/hr
Grinding & Packing = 1.8 x 0.15 = 0.27 t/hr
Blending is the bottleneck as it results in the underutilisation of the whole process

Q2 (b) Capacity is determined with the bottleneck working at full capacity.
Capacity at Blending is 90 t/hr. 10% of that 90 tons/hr (9 tons/hr) goes to Roasting; 20% of that 9 tons/hr (1.8 tons/hr) goes to Grinding & Packing. 15% of that 1.8 tons/hr (**0.27 tons/hr**) is the final product and the existing capacity of this plant.

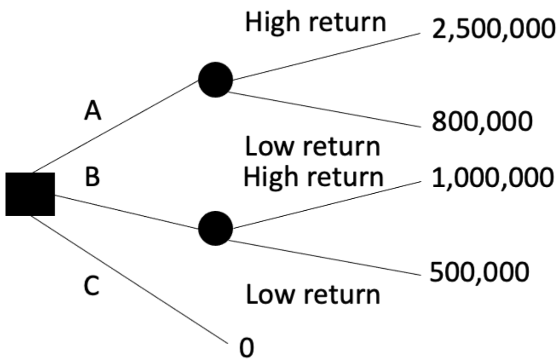
Q2 (c) Inflow to blending is 70 tons/hour. Capacity at blending is 90 tons/hr. Hence, utilisation at blending is 70/90 =**77.77%**
Outflow from blending is 0.1*70 = 7 tons/hour. Capacity at roasting is 60 tons/hour and utlisation is 7/60 = **11.7%**
Outflow from roasting is 0.2*7 = 1.4 tons/hr. Capacity at grinding and packing is 50 tons/hr. Hence utilisation at grinding and packing is 1.4/50 = **2.8%**

Q2 (d)
This question can be answered in the following ways:
Option 1: The students can take the 70 tons/hr from Q2c forward to answer this question:
Without technology, only 15% of 1.4 tons/hr that goes into grinding and packing flows into processing (**0.21 tons/hr**).
Capacity at reprocessing is 10 tons/hr. All of the inflow to reprocessing is converted to coffee grounds and is added to the outflow of coffee grounds from grinding and packing.
The new capacity due to installing Technology A is **1.4 tons/hr**
A comment can be made on the efficiency of investing in Technology A i.e., is it a significant increase from earlier process? Or change in bottleneck?

Option 2: The students can assume the 90 tons/hr (capacity of blending) as input:
Then, the Outflow from blending = 9 tons/hr and Roasting = 1.8 tons/hr
Without technology, only 15% of 1.8 tons/hr that goes into grinding and packing flows into processing (0.27 tons/hr).
Capacity at reprocessing is 10 tons/hr. All of the inflow to reprocessing is converted to coffee grounds and is added to the outflow of coffee grounds from grinding and packing.
The new capacity due to Technology A is **1.8 tons/hr**
A comment can be made on the efficiency of investing in Technology A i.e. is it a significant increase from earlier process?

Q2 (e) **Option 1**: Similar to Q2(d), the students may take either 70 tons/hr or 90 tons/hr as input and the resulting capacity could closer to Technology A.
(OR)
Option 2: Students might assume a steady state and make calculations accordingly.
A comment/observation on the effectiveness of the Technology B
A comment/observation on which Technology is better (cost vs efficiency)

Q3 (a) The decision tree would be as follows:



Q3 (b)
EMV Choice A = £1,480,000
EMV Choice B = £650,000
EMV Choice C = £0
Choice A is suitable since the EMV is the highest

Q3 (c) The payment for the advertisement will depend upon how the student justifies the argument considering that there is a 70% chance for 'high' returns to materialize. A new Decision Tree and expected values can then be used to justify what they are willing to pay (i.e. whole Ad campaign for Choices A and B or the Ad campaign for Choices A and B separately) in relation to the investment costs mentioned in the question. Student can also discuss differentiating between the benefit of advertisement investments for Choice A and B or mention the dependency on the risk that the company is willing to take. Students might also draw a different decision tree that considers the decision node as an advertisement decision.