SOLUTIONS TO HW 2

Q1. GDP = Private Consumption Expenditures (5000) + Investment (1000) + Government Expenditures (500; see below for calculation) + (Exports - Imports) (-200)

Government Expenditures = Deficit-Transfers + Taxes (Hence, with the given data Gov’t exp = 500)

The country will be a net borrower because it has a trade deficit (exports - imports) of -200.

Q2. a. Since there is no investment, government sector, or exports/imports in this question, the expenditure method of calculating GDP includes only private consumption:

GDP = sales of cakes to HH + sales of sugar to HH = $80 + $5 = $85.

b. Value added by firm A = Total revenue of firm A - value of intermediate inputs purchased by firm A = $30 - $0 = $30

c. Value added by firm B = $80 - $25 = $55

d. Total profit of Firm A = Total revenue of firm A - total cost of production for firm A = $30 - ($10 - $20) = $0

Total profit of Firm B = Total revenue of firm B - total cost of production for firm B = $80 - ($20 + $25) = $35.
(Note that the HH earns $30 in wages from the firms. Since firm A pays $10 as wages, it must be the case that firm B pays $20 in wages.)

e. The total value of intermediate inputs used is $25 of sugar used by the bakery.

Q3. (i) the firm’s problem:

\[
\max_{(r, l^D)} \left\{ pY - wL^D \right\} \quad \text{subject to} \quad Y = \left( L^D \right)^{2/3}
\]

Substitution method: \[
\max_{(l^D) > 0} \left\{ p \left( L^D \right)^{2/3} - wL^D \right\}
\]

FOC: \[
p \frac{2}{3} \left( L^D \right)^{-1/3} - w = 0 \Rightarrow L^D = \left( \frac{w}{p \frac{2}{3}} \right)^{-3}
\]
(ii) the household’s problem:

\[
\max_{(c,l^s) \geq 0} \left\{ \log C + \log(1 - L^s) \right\} \quad \text{subject to} \quad p.C = w.L^s
\]

Substitution method: \( \max_{l^S \geq 0} \left\{ \log \frac{w.L^S}{p} + \log(1 - L^S) \right\} \)

\[
\frac{w^S}{p} + \frac{-1}{1 - L^S} = 0 \Rightarrow L^S = 1/2
\]

FOC: \( \frac{p}{w.L^S} + \frac{-1}{1 - L^S} = 0 \Rightarrow L^S = 1/2 \)

(iii) \( L^S = L^D \Rightarrow \frac{1}{2} = \left( \frac{w}{p} \right)^{1/2} \Rightarrow \left( \frac{1}{2} \right)^{-1/3} = \frac{w}{p} \Rightarrow \frac{w}{2}^2 = \frac{1}{2} \Rightarrow 2^3 = 0.84 \)

\( L_E = \left( L^D \right)_E = \left( L^S \right)_E = 1/2 \)

\( Y = \left( L^D \right)^{2/3} = \left( 1/2 \right)^{2/3} = 0.62 \) (from the production function)

\( C = \frac{w^L}{p} = 0.84 \frac{1}{2} = 0.42 \) (from the budget constraint)

(iv) Using \( P = \frac{M^S}{k_C} \), we find that \( P = \frac{10}{5 \times 0.42} = 4.76 \). Hence, the nominal wage is \( 4.76 \times 0.84 = 3.99 \).
Q4.

Private consumption expenditures as % of GDP
We observe that the most volatile series is Investment, and the least volatile is the consumption. There is a trade deficit after 1977 (net exports are negative.) Government expenditures increase tremendously during the Second World War era.

Q5. 1. Gross Domestic Product: GDP is the value of all final goods and services produced in the US within a certain period.

Gross Domestic Income: GDI is the GDP measured using the income approach, that is, GDI is the sum of all incomes accruing to the labor, capital, and government.

Gross National Income: GNI is GDI plus income receipts from the rest of the world less income payments to the rest of the world. It is the sum of incomes that the US citizens earn independent of where the production takes place.

Gross National Product: GNP is the production measure of GNI.

2. Private consumption expenditures: Consists of purchases of goods and services by households and by non-profits institutions serving households. It is divided into three major categories: consumption expenditure on durable goods, non-durable goods, and services.
Gross private domestic investment: Consists of purchases of equipment, software, and structures (fixed assets) by private businesses that contribute to the production and last more than one year, purchases of homes by households, and private business inventories. Intermediate inputs are not a part of investment.

Imports: Consists of goods and services that are sold or transferred by the rest of the world to the US.

Imports enter into the GDP negatively, because market transactions do not distinguish goods and services according to the origin, that is, the value of imported goods and services are already accounted for in C, I, or G categories of GDP. Since those goods are not produce in the US, we need to subtract their value.

3. Components of Gross Domestic Income: It consists of compensation of employees, taxes on production and imports less subsidies, net operating surplus of private and public enterprises (i.e, profits), and consumption of fixed capital.

Subsidies are extra income to individuals and spending for the government. Therefore, compensation of individuals includes subsides; but we subtract them from the tax revenue of the government.

Consumption of fixed capital (CFC) is defined as the charge for the using up of private and government fixed capital located in the United States. It is the decline in the value of the stock of fixed assets due to wear and tear, obsolescence, accidental damage, and aging. For general government and for nonprofit institutions that primarily serve individuals, CFC serves as a measure of the value of the current services of the fixed assets owned and used by these entities.

4. Real GDP is found by dividing the nominal GDP by the GDP price index. The GDP price index measures the prices paid for goods and services over time relative to a reference year. It is derived from the prices of personal consumption expenditures (PCE), gross private domestic investment, and government consumption expenditures and gross investment. It includes price changes in exports of goods and services and excludes price changes in imports of goods and services.