S5 Geography Practice Paper (2): Population Structure and Dependency Ratios, Rainfall Runoff and Peak Discharge, Urban Land Use and Bid-Rent Curves, Farming Systems and Food Production, Industrial Location and Production Cost, Coastal Erosion and Coastal Management (100 marks)

S5 Geography | 100 marks | 75 minutes

Question 1: Population Structure and Dependency Ratios

A city has a total population of 7.5 million: 0.9 million aged under 15, 1.35 million aged 65 or above and 5.25 million aged 15 to 64. Its land area is 1,100 square kilometres.

Calculate the total dependency ratio. *(4 marks)*

Calculate the old-age dependency ratio. *(4 marks)*

Calculate the population density per square kilometre, to the nearest whole number. *(4 marks)*

What pressure does a rising old-age dependency ratio place on public finances? Give two points. *(4 marks)*

Question 2: Rainfall Runoff and Peak Discharge

A catchment of 120 square kilometres received 180 mm of rain in 24 hours. The runoff coefficient is 0.45.

What was the total volume of rainfall over the catchment in cubic metres? *(4 marks)*

Calculate the total runoff volume in cubic metres. *(4 marks)*

If the runoff drains evenly over 24 hours, what is the mean discharge in cubic metres per second? *(4 marks)*

The measured peak discharge is 2.8 times the mean. Calculate the peak discharge and explain why urbanisation makes the peak higher. *(4 marks)*

Question 3: Urban Land Use and Bid-Rent Curves

In a city, commercial land at the centre costs $1,200 per square metre per month and the bid rent falls by $150 for each kilometre from the centre; residential land starts at $600 and falls by $40 per kilometre.

What is the commercial bid rent 10 km from the centre, and is bidding worthwhile there? *(3 marks)*

What is the residential bid rent 10 km from the centre? *(3 marks)*

At what distance from the centre do the two bid rents become equal? *(5 marks)*

Explain why commercial activities concentrate near the city centre. *(5 marks)*

Question 4: Farming Systems and Food Production

A farm has 20 hectares of land. Rice yields 6.5 tonnes per hectare, sells at $4,200 per tonne, and costs $18,000 per hectare to produce.

What is the total rice output in tonnes? *(4 marks)*

What is the total profit from rice farming? *(4 marks)*

If vegetables were grown instead, yielding 25 tonnes per hectare at $1,500 per tonne with costs of $28,000 per hectare, what would profit per hectare be? *(4 marks)*

Should the farm switch entirely to vegetables? Give one factor to consider. *(4 marks)*

Question 5: Industrial Location and Production Cost

A manufacturer compares the annual costs of two sites at an output of 130,000 units. Site A: land rent $600,000, wages $2,400,000, transport $900,000, other $500,000. Site B: land rent $240,000, wages $2,700,000, transport $1,350,000, other $500,000.

What is the total annual cost at Site A? *(4 marks)*

What is the total annual cost at Site B? *(4 marks)*

Which site should the firm choose, and what is the difference in unit cost? *(4 marks)*

If wages at Site A rose by 20 per cent, would the conclusion change? Support your answer with calculations. *(4 marks)*

Question 6: Coastal Erosion and Coastal Management

Along one stretch of coast the shoreline retreated 30 m inland between 1990 and 2020. The government is considering a seawall along 2 km of that coast at $45,000 per metre, with annual maintenance of 0.5 per cent of the capital cost.

Calculate the average annual rate of erosion. *(5 marks)*

If the rate stays the same, how much further will the shoreline retreat by 2050, and what is the cumulative retreat since 1990? *(5 marks)*

What are the total capital cost and the annual maintenance cost of the seawall? *(5 marks)*

Explain one advantage and one limitation each of a hard and a soft coastal management measure. *(5 marks)*