



Answer all questions

Question 1

(11 marks)

The table shows river's average monthly flows, which were measured over a year.

Month	Flow Q (m ³ /s)	Month	Flow Q (m ³ /s)	Month	Flow Q (m ³ /s)
Jan.	35	May	70	Aug.	95
Feb.	45	June	75	Oct.	41
Mars	88	July	92	Dec.	33

Using numerical integration, write a computer program which reads the data and then estimates the water volume (in m³) passing through the river during that year.

Question 2

(11 marks)

The water surface at a dam's upstream forms a long curve. On this curve, the elevation E of water surface varies with distance x from the dam (in meter units) as follows: $E = 170.15 - 0.12 \ln(x+1)$. It is required to write a program that computes the distance S , beyond which the water surface would have a constant elevation H . (Use a 0.5 meter step in the x direction and assume an acceptable error of 1 mm in H)

Question 3

(11 marks)

Rainfall (cm)	88.1	107.2	103.3	147.9	127.0	93.2	119.3	105.8	150.1	77.3
Flow (m ³ /s)	14.9	19.2	17.1	26.7	23.5	16.8	20.6	18.3	27.8	12.7

The table shows the measured rainfalls and the corresponding water flows through a river. Write a program which reads these data and uses the 1D-IDW interpolation to estimate the flow for a rainfall of 123 cm (Take $p = 2$)

Question 4

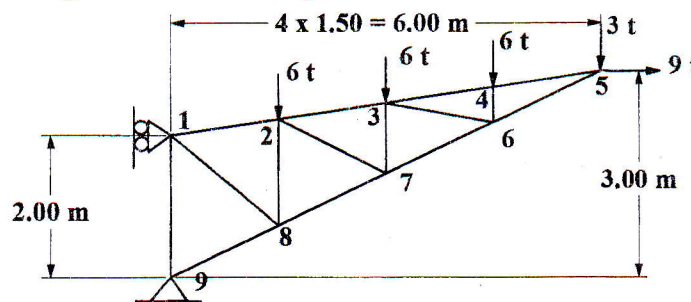
(11 marks)

Given are n terrain points with known horizontal coordinates and known elevations. There are other m points with known horizontal coordinates only. Write a program which reads the coordinates & elevations of the n data points; and the coordinates of the m points. Then, using the 2D-IDW interpolation, the program computes the elevations of the m points. (Take $p = 3$, maximum $n = 300$, maximum $m = 200$)

Question 5

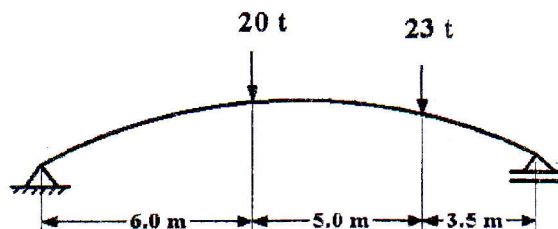
(8 marks)

Show the arrangement of the input data which are required for the solution of the following truss.



Question 6

(8 marks)



With the origin at the left support, the equation of the shown arch is given by: $y = -0.0385x^2 + 0.5577x$.

Calculate the reactions. Then, write a program to compute the normal forces. (Every 1cm along the x direction)

With my best wishes.

This exam measures the following ILOs															
Question Number	Q1	Q2	Q4	Q5	Q6	Q2	Q3	Q5	Q6	Q6	Q2	Q3	Q4	Q5	Q6
	a-1-	a-4-	a-5-	a-1-	a-4-	b-2-	b-2-	b-2-	b-4-	b-8-	c-6-	c-7-	c-6-	c-6-	c-7-
Skills	1	5	1	1	5	1	1	1	1	1	1	1	1	1	1
	Knowledge & Understanding Skills					Intellectual Skills					Professional Skills				