ME BAE 613 mechanical Instramentation

Process

Part (1)

① use matlab to compute the average of a set of temperatures 100, 120, 118 and plot time vs temperature.

② The distribution of masses and distances are as follows

mass = 30, 60, 40, 70

Distance = 350, 500, 750, 1050

Find centre of gravity by using matlab

Part 2

③ Appropriate displacement equation for the simply supported beam of Length H and Section Property EI - Displacement equation is $y(x) = A \sin \pi x / H$. The governing differential equation is $EI \frac{d^2y}{dx^2} - \frac{wx(H-x)}{2} = 0$

Evaluate A by minimizing integral

(4) $y(x) = A \sin \pi x / H$

$$EI \frac{d^2y}{dx^2} - \frac{Wx(H-x)}{2} = 0$$

Evaluate A using subdomain method

(5) The nodal co-ordinates x_i and x_j and the nodal values of ϕ_i and ϕ_j for several linear elements are given below. Evaluate ϕ at given value x

	x	x_i	x_j	ϕ_i	ϕ_j
(a)	0.8	0.0	1.5	60	43
(b)	3.6	3.0	4.5	24	33
(c)	7.1	6.5	7.5	63	51

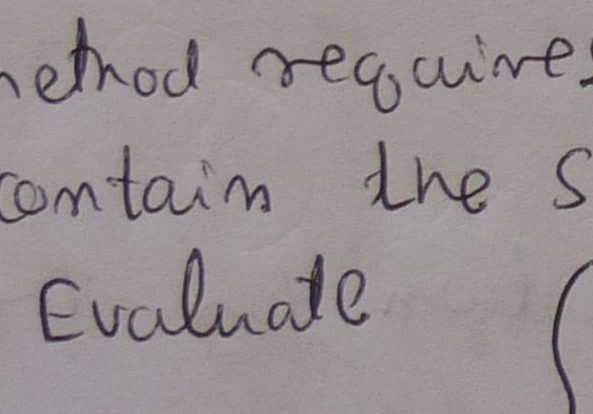
(6) The implementation of the finite element method requires the evaluation of integrals that contain the shape functions or their derivatives

Evaluate $\int_{x_i}^{x_j} \frac{dN_i}{dx} \frac{dN_j}{dx} dx$

(7) Evaluate the residual equation for node one using the weighing function shown in Figure.

$$R_s^{e+1} = D \frac{d\phi}{dx}\bigg|_{x=x_s} + \frac{D}{L}(\phi_s - \phi_t) - \frac{\partial L}{2} \text{ with } (e+1) = 1$$

$s=1 \quad t=2$



(8) verify that N_i for the triangular element is equal to one at node i and equal to zero at node j and k

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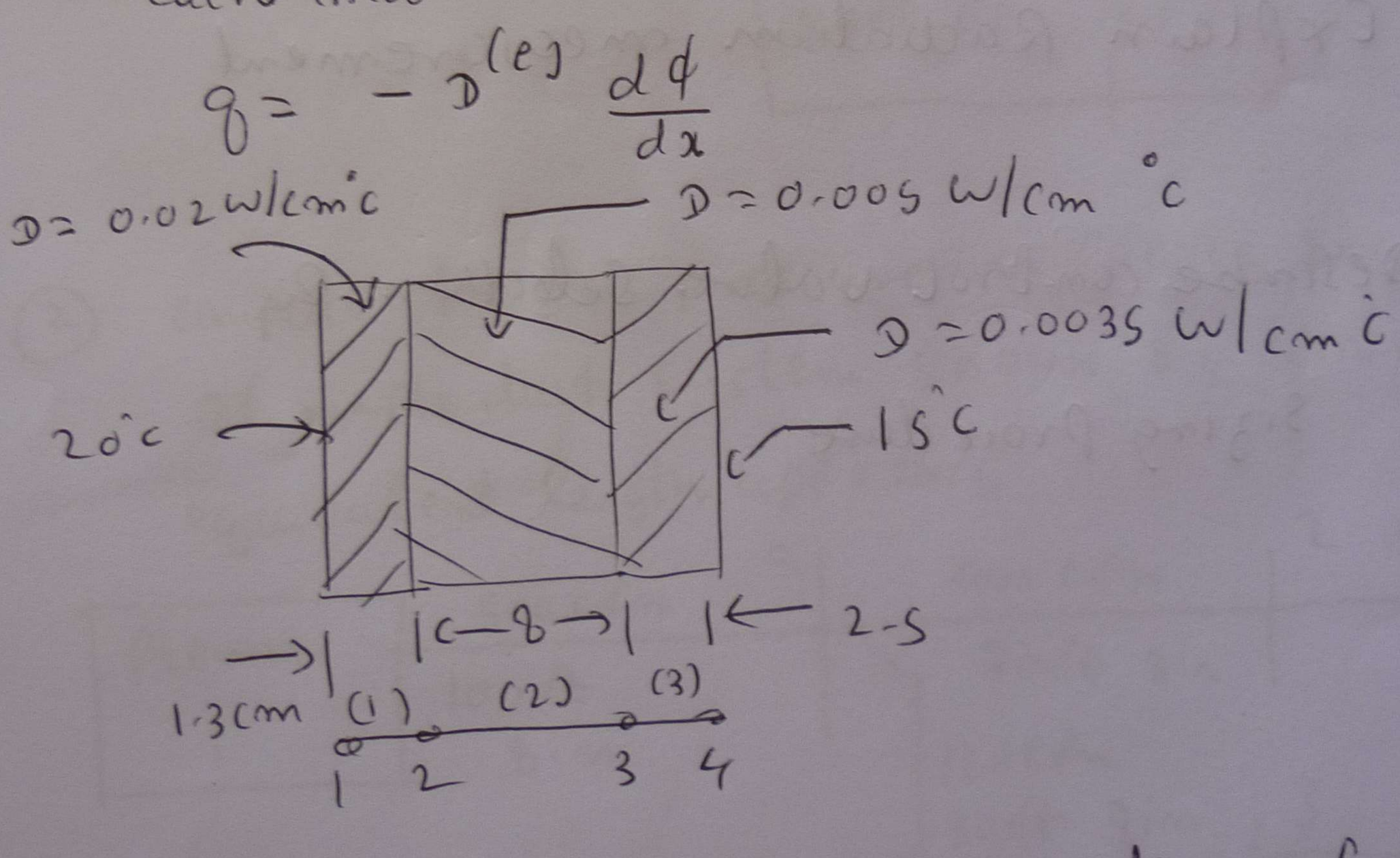
(9) The differential equation $D^{(e)} \frac{d^2\phi}{dx^2} = 0$ is applicable to each section of the composite wall shown in figure where $D^{(e)}$ is thermal conductivity. Calculate the temperature values within the wall and evaluate heat flow through each material. The heat flow is given by

$$q = -D^{(e)} \frac{d\phi}{dx}$$



(10) Develop the system of equations for above Problem (9) using element matrix and direct stiffness concept.

Part 3

(11) Explain principle of flow measurement

(12) Describe testing & commissioning of Sub system

(13) Describe basic measurement & control concept

(14) Explain Radiation measurement

(15) Describe control valve selection & Sizing Procedure