AML 190 DESIGN ENGINEERING

Major Part B **4th May 2007** **11.30 am to 12.30 pm**

Max. Marks: **35**

Q1) a) List at least 3 non-negotiable constraints on the design of the valve-leak testing machine designed by Mr. Yunus Patel and explain why they are non-negotiable. (4)

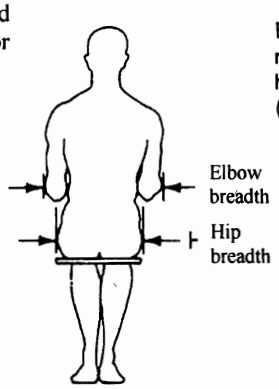
b) Give at least three features of the Anangpur dam that make the design very different from that of modern dams. Also explain why it appears that the lowest level sluices were meant to operate below ground level. (5)

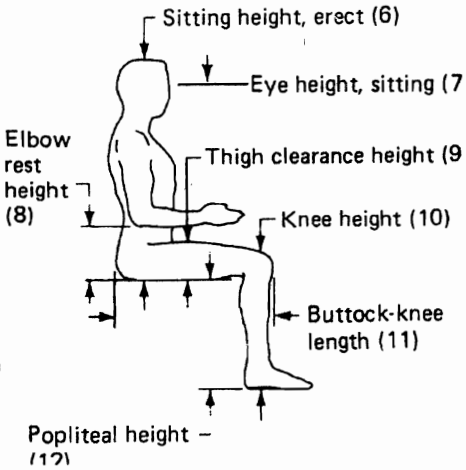
Q2) Discuss the feasibility of three concept designs ***each*** for **any two** of the following engineering products/systems: (Use sketches as required.)

i) Air conditioning system for a petrol/gas processing plant
ii) A system to automatically turn on and off lighting in corridors and bathrooms of hostels/hospitals.
iii) A lecture theatre (150 capacity) that uses minimum artificial light during the day and is comfortable without fans/a.c. during Delhi summers.
iv) A reliable and rugged system that will help wheel chairs negotiate stairs --- to be operated by one person other than the occupant of the wheel chair.
v) A system that takes care of the lighting needs of a school through the exercise effort of students (15-20 minutes a day).
vi) A cooling system for a motorcycle helmet. (12)

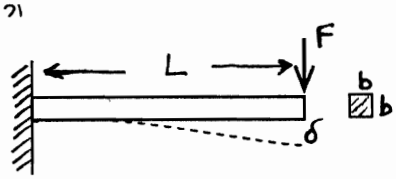
Q3) State which anthropometric data, if any, you would use to design the following products (see figures for some of the anthropometric data that could be used). Also state whether you would base the design on the extreme value, a range or the average value.

i) Dining chair and table
ii) Instrument panel in an aircraft
iii) Berth in a train
iv) Position of the slot in a mail box
v) Diameter of a table fan
vi) Handle on a coffee mug
vii) Door of a microwave oven
viii) Length of a tooth brush. (6)





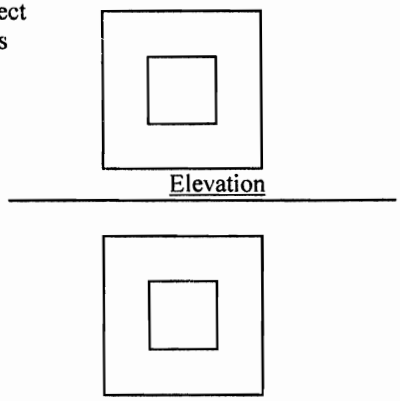
Q4) Determine the relevant material index for minimizing the mass of a cantilever beam of a given length L if the deflection at the end should not exceed δ_o. The beam is meant to carry a load F at the end as shown. The beam is square sectioned of side b (variable). Neglect the load due to self weight.



The deflection at the end of a cantilever beam is given by:

$$\delta = \frac{FL^3}{3EI}, \text{ where, } I = \frac{b^4}{12} \text{ and } E \text{ is the modulus of elasticity.} \quad (3)$$

Q5) Two views (plan and elevation) of 3-D solid object are shown. There are no hidden lines or edges as they would have appeared as dotted lines in the drawing. Sketch the end view.



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End View (5)

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