

UNIVERSITY OF LONDON
B.Sc. (ENGINEERING) EXAMINATION 1964
PART III

for Internal and External Students

(24) PROPERTIES OF MATERIALS

10 - 100.
Thursday 18 June: 2.30 to 5.30

Answer SIX questions.

1. A fillet weld was made between two plates of a low-alloy steel containing 0.23 per cent of carbon and 1.8 per cent of manganese. Tests on the completed weldment showed cracks near the weld, and that this region was much harder than either the weld metal or the parent plates. Discuss the probable causes of the cracking. Specify the welding procedure that you would recommend for minimising the recurrence of these defects.
2. Sketch the load-extension diagrams that would be obtained from tensile tests of mild steel in (a) the hot rolled, and (b) the cold rolled conditions.
Three samples of cold-rolled mild steel are annealed for 1 hour at (i) 200°C, (ii) 600°C, and (iii) 900°C respectively, and slowly cooled. Sketch and describe the microstructures of the cold-rolled mild steel, and of each of the annealed samples. Show, by means of a diagram, the effects of annealing temperatures of up to 900°C on the hardness and tensile properties of cold-rolled mild steel.
3. Explain what is meant by (a) fatigue limit and (b) endurance limit.
Give a brief account of the mechanism of fatigue failure in metals.
Comment on the effects of the following on the fatigue properties of a component:
(i) surface finish;
(ii) nitriding or cold working of the surface;
(iii) corrosion.
4. Describe and compare the various methods of applying preservatives to timber; in each case give examples in which the finished product would be used.
5. Discuss the following in relation to concrete:
high-alumina cement, air entrainment, accelerators, no fines, effect of frost.
6. List the different materials used as aggregate in concrete mixes and comment on their particular properties and value in engineering construction.

7. Describe and briefly compare the methods by which water may be chlorinated. Name any subsequent treatment that may be required as a consequence of the method. List alternative methods of disinfection.
8. Give the causes of the following defects in finished concrete and suggest in detail how they could have been prevented: (a) honeycombing; (b) form marks; (c) reinforcement exposed at surface.
Give an account of construction joints in typical parts of reinforced concrete structures.
9. Describe the manufacture, preparation and laying of hot-rolled asphalt for a road surface giving suitable dimensions as appropriate. Describe also one of the tests normally applied to bitumen and its purpose.

M. S. FISHER
F. C. SCOTT
D. LLOYD THOMAS
J. WALKER

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Sample Room

