November 2014

Questions not necessarily in the order they appeared on the examination sheet.

1. Explain EACH of the following engineering terms:-
   a) Hardness; (2)
   b) Proof Stress; (2)
   c) Ultimate Tensile Strength (UTS); (2)
   d) Young's Modulus; (2)
   e) Yield Stress. (2)

2. a) Explain the process of brazing for the joining of metals to alloys. (4)
   b) State TWO methods by which a cracked aluminium alloy pump casing might be repaired. (2)
   c) Describe FOUR functions that flux performs in the brazing process. (4)

3. Explain how EACH of the following is carried out for mild steel:-
   a) Tempering; (2)
   b) Hardening; (2)
   c) Nitriding; (2)
   d) Normalising; (2)
   e) Gas Carburising. (2)

4. With reference to paralleling and load sharing of generators, explain EACH of the following:-
   a) The possible causes of no voltage indication on start-up of a stand by generator; (2)
   b) The purpose of the "no voltage protection interlock"; (2)
   c) The reason for the incoming machine to be running slightly faster than the busbar frequency at the instant of closing the incoming breaker; (2)
   d) How equal kVAr load sharing is maintained; (2)
   e) Why the power factors may be different even though the kW loads are equal. (2)

5. With reference to a 3-phase motor supplied with a six terminal connection in the terminal box:-
   a) Sketch the terminal connection so that the motor will run in permanent delta mode; (6)
   b) Explain the relationship between phase voltage, phase current, line voltage and line current, when the motor is connected in delta. (4)

6. a) Explain EACH of the following control terms:-
      i) Proportional Bandwidth; (2)
      ii) Integral; (2)
      iii) Derivative. (2)

b) Describe a 3-step method for tuning a PID Controller. (4)

7. a) List FIVE fuel properties which are used in a fuel oil specification. (5)
   b) List FIVE impurities found in a fuel oil. (5)

8. a) List TWO methods of finding osmosis in a fibre glass hull. (2)
   b) Describe the operations of removing it. (4)
   c) Explain why drying it out does not work. (4)

9. a) Sketch the relationship between true power (kW), apparent power (kVA), reactive power (kVAr) and power factor (cos thi), in a.c. electrical generation. (4)
   b) Explain how true power (kW) and reactive power (kVAr) is shared between two generators connected in parallel. (4)
   c) Explain how kW and kVAr load sharing stability is achieved. (2)

10. Explain, with the aid of a diagram, the principle of a closed loop control method for regulating the lubricating oil temperature of a diesel engine. (10)