



Sample Questions

REVISED FIRST CLASS PARTS B1, B2, AND B3

(NOTE: these questions are intended as representations of the style of questions that may appear on examinations. They are not intended as study material and, as such, may not be in line with any current examination syllabus)

1. A steam engine operates on the Carnot cycle between pressure limits 3,000 kPa and 4 kPa. The working fluid is saturated liquid at the end of isentropic compression and dry saturated vapour at the beginning of isentropic expansion.

Calculate the:

- (a) thermal efficiency
 - (b) work transfer per kg steam
 - (c) heat rejected per kg steam
 - (d) mass of steam condensed during isothermal heat rejection
 - (e) steam dryness fraction at the end of isentropic expansion
 - (f) steam dryness fraction at the end of isentropic compression
2.
 - (a) With reference to blade speed, steam speed, blade angle and steam thrust, give four design characteristics of impulse turbine blading and reaction turbine blading.
 - (b) What is meant by the term "critical pressure of a steam turbine nozzle?"
 - (c) What influence does the critical pressure have on the divergent part of a turbine nozzle?
 3.
 - (a) Explain why is it necessary to allow for expansion in a large turbine casing.
 - (b) With the aid of a simple line sketch, describe the anchorage system for a three cylinder, tandem compound, reaction turbine.
 - (c) Explain what precautions should be taken to ensure free expansion during the operation of the machine in (b).



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4.
 - (a) List six characteristics of an ideal diesel fuel.
 - (b) Relative to a diesel engine what is meant by:
 - (i) ignition lag;
 - (ii) injection lag.
 - (c) Give three causes of injection lag.

5.
 - (a) Explain five characteristics of a gas turbine which would make it advantageous in its selection.
 - (b) Provide a P-V diagram for a gas turbine showing the effect of intercooling and reheating. A brief explanation of the effect obtained should accompany your diagram.

6. Describe how oxygen removal is accomplished in the production of the following types of steel.
 - (a) rimmed steel;
 - (b) capped steel;
 - (c) killed steel;
 - (d) semikilled steel

7.
 - (a) Describe how you would conduct a Brinell hardness test.
 - (b)
 - (i) Describe briefly the gas tungsten arc welding process.
 - (ii) How would you detect tungsten inclusions in a weld?
 - (iii) What steps would you take to minimize tungsten inclusions in a weld?



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8. Discuss in detail the characteristics of carbon-dioxide, argon and helium gases in shielding of arc welding.
9. Describe the procedure you would use to set a small motor driven single stage pump on its foundations. Assume the foundation has to be laid and the suction and discharge piping will be installed at a later date.
10. (a) Name six properties that lubricating oils are tested for.
(b) plain the significance of each of these properties.
11. Assume you are the chief engineer of a medium size power plant. Explain how you would organize a one week boiler outage for repair and annual inspection, you may use a Gantt Chart (Bar chart) to illustrate your answer.
12. (a) Define a cascade refrigeration system.
(b) Sketch a two stage cascade refrigeration system.
13. Air at 101.3 kPa and 30° C has a wet bulb temperature of 20° C. Calculate the relative humidity.
14. Sketch and describe an oil system for a two stage oil cooled sliding vane compressor.
15. With respect to employee development, there are three main training methods. One of these methods is on-the-job training.
 - (a) List and describe in detail the other two main training methods.
 - (b) List and briefly describe the three ways used in on-the-job training.