Code No. 2127 / O

FACULTY OF ENGINEERING

B.E. 3/4 (Mech.) I-Semester (Old) Examination, November / December 2012

Subject: Applied Thermodynamics

Time : 3 Hours **Max. Marks: 75**

Note: Answer **all** questions of Part - A and answer any **five** questions from Part-B.

PART – A (25 Marks)

1. How does a single-acting reciprocating air-compressor differ from a double-acting reciprocating air-compressor? (3)
2. Mention the functions of (i) inter cooler and (ii) after-cooler as referred to a multi-stage reciprocating air compressor. (2)
3. How does a spark ignition (SI) petrol engine differ from a compressor ignition (CI) diesel engine? (3)
4. Define (i) bsfc and (ii) isfc as applied to an Internal Combustion Engine. What is their significance? (2)
5. How do premixed flames differ from diffusion flames as referred to IC engines? (3)
6. Mention the names of at least two additives each that help in controlling knocking phenomenon in SI and CI engines. (2)
7. How do fire (or smoke) tube boilers differ from water tube boilers? (3)
8. Mention two salient differences between Jet Condensers and Surface Condensers. (2)
9. Briefly describe the advantages of "reheating" between "successive expansion stages" vis-à-vis a Rankine vapor power cycle. (3)
10. Mention the different types of steam nozzles used in engineering practice. (2)

PART – B (5x10=50 Marks)

11. The cylinder bore diameter and the piston stroke length of a single-acting, single-cylinder, air-compressor are, respectively, measured to be 15 cm and 20 cm. Air is inhaled into the cylinder at a pressure of 1 bar (abs), while the temperature is $20^{o}C$. It is then compressed, according to the law $pv^{1.35}$ = constant, to a pressure of 6 bar (abs). Calculate the theoretical HP required to drive the compressor, while running at 110 rpm. Also, calculate the mass flow rate of air handled by the compressor. (10)

12. Explain the principle of working of a 4-stroke cycle spark ignition petrol engine along with a neat pertinent schematic diagram for the same. How does it differ from a 4-stroke cycle compression ignition Diesel engine? (10)

13. A 4-cylinder, 4-stroke SI (petrol) engine gave the following results during trial on the same: Bore= 6.5 cm; stroke = 9.5 cm ; speed = 3000 rpm ; clearance volume provided = 65 cm^3; relative efficiency based on brake thermal efficiency = 50% ; heating value of fuel used = 46054.8 kJ/kg ; torque developed =68.67 N-m; mechanical efficiency = 80% ; T(adiabatic index) for air = 1.4 Calculate (i) sfc and (ii) bmc P for the above engine. (10)

14. Define and explain 'ignition delay' as referred to a CI (Diesel) engine. How does this trigger the phenomenon of "knocking"? Explain the various measures available to avert the above tendency in the engines. (10)

15. Explain the basic principle of evaporative cooling that is used in cooling towers in steam power plants. With a neat pertinent diagram, explain the principle of operation of an atmospheric (or hyperbolic) cooling tower. (10)

16. Dry saturated steam at 10 bar (abs) is expanded in a steam nozzle to 0.4 bar (abs). The throat area is $7cm^2$, while the inlet velocity is negligible. Calculate the mass flow rate of steam through the nozzle and also find the exit area. Assume isentropic flow and take the index (n)=1.135 for dry saturated steam.

17. Clearly explain the relevance of
    (a) regeneration and
    (b) Cogeneration in "augmentation of the thermodynamic performance" of a steam-power Rankine cycle.

*****