



FACULTY OF ENGINEERING

B.E. 3/4 (Mech./Prod.) I Semester (Suppl.) Examination, July 2010

APPLIED THERMODYNAMICS

Time : 3 Hours]

[Max. Marks : 75

**Instructions:** 1) Answer *all* questions of Part A.

2) Answer *five* questions from Part B.

PART – A

(25 Marks)

1. How does a double-acting compressor differ from a single-acting compressor ? 3
2. Define “Clearance factor” and “Volumetric efficiency” as applied to a compressor. 2
3. Distinguish between 2-stroke and 4-stroke I.C. engines by mentioning atleast three distinguishing features. 3
4. Define “b & fc” and “isfc” as referred to an I.C. engine. 2
5. What do “additives” do in petrol engines ? Give atleast two chemicals meant for the job. 3
6. What are the two components in “ignition delay” in a C.I. engine ? How do they influence combustion here ? 2
7. Distinguish between “mountings” and “accessories” vis-a-vis a steam boiler. Give one example for each. 3
8. What is the principle on which a “cooling tower” works ? 2
9. How does “Rankine vapor cycle” differ from a “Darmt vapor cycle” ? 3
10. What is the relevance of “Critical pressure ratio” in a convergent-divergent steam nozzle ? 2

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(This paper contains 2 pages)



## PART – B

(5×10=50)

11. A double-acting, single-stage reciprocating air compressor takes air at 0.981 bar (abs) and 32° C and delivers at 6.32 bar (abs). The clearance is 5% of the stroke volume. The compression and expansion occur as per the law  $PV^{1.32} = C$ . Compressor handles 17 m<sup>3</sup>/min of air, when measured at 1 bar and 15° C. Determine the temperature of air delivered, stroke volume and indicated power of the compressor in KW if it runs at 500 rpm. 10
12. What are the functions performed by a “Carburetor” in an SI engine ? With pertinent sketches, explain (i) single-float type carburetor and (ii) Zenith Carburetor. 10
13. Draw Pressure-Crankangle diagrams for both SI and CI engines involved in (i) normal and (ii) abnormal combustion. Explain them in detail. How could we observe “knocking” in each case ? 10
14. Explain the working principle of Lancashire boiler with a neat sketch. 10
15. Draw the schematic, T-S and P-V diagrams of a Rankine Vapor power cycle with “Reheating” between two stages of expansion. Explain its working principle. 10
16. Steam at a pressure of 12 bar (abs) and 0.96 dryness is expanded through a convergent-divergent steam nozzle and the pressure of steam leaving the nozzle is 1 bar (abs). Find the velocity at throat for maximum discharge, by taking  $n = 1.25$ . Also, Calculate the area at exit and the discharge, if the throat has an area of 1.2 cm<sup>2</sup>. Assume the flow to be friction-free and adiabatic. 10
17. A) Draw the “Value Timing Diagram” for a 4-S SI petrol engine and Explain its salient features. 5  
 B) What are the functions performed by (i) Damper, (ii) Water gauge, (iii) Super heater and (iv) Economiser in boilers ? 5