

**FACULTY OF ENGINEERING****B.E. 3/4 (Mech.) I-Semester (Main) Examination, November 2013****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. Define and derive an expression for volumetric of reciprocating air compressor in terms of pressure ratio, index of compression and expansion. (3)
2. What are the advantages of multistage compressor over single stage compressor? (2)
3. Explain with a neat sketch "simple carburetor" of an IC engine. (3)
4. Write any three major differences between two stroke and four stroke engine. (2)
5. Discuss on rating of fuels in S.I. and C.I. engines. (3)
6. Define "Ignition Decay" and give its significance. (2)
7. Define the terms Boiler mountings and Accessories. (2)
8. Define condenser and explain any one type of jet condenser. (3)
9. Classify the thermodynamics cycles. (2)
10. Explain with sketch for variation of pressure convergent divergent nozzle. (3)

**PART – B (5x10=50 Marks)**

11. A single acting two state air compressor is installed at an altitude of 1600 mts, deals with  $5\text{m}^3/\text{min}$  of air under free air condition of 1 bar and  $15^\circ\text{C}$  the suction temperature is  $3^\circ\text{C}$ . Due to high altitude the compressor delivers air at 16 bar. If the inter cooling is perfect, design the cylinder diameters and common stroke and speed of machine. Assume clearance 4% of swept volume for both cylinders, stroke equal to diameter of LP cylinder, mean piston speed 2 m.s,  $n=1.3$  sea level conditions as 1 bar and a fall of pressure of or bar per 1000 mts of altitude.
12. The following conditions are obtained on full load conditions on a single cylinder 4-strokes diesel engine.  
Area of indicator card =  $300\text{ mm}^2$ ; length of diagram = 400 mm; spring constant = 1 bar / mm ; speed of engine 400 rpm ; Load on brake = 370 N; spring balance reading = 50 N; Distance of brake drum = 1.2m ; fuel consumption = 2.8 kg/h; calorific value of fuel 1 = 41800 kJ/kg distance to cylinder = 160 mm; stroke of piston = 200mm Calculate : (i) Indicated mean effective pressure (ii) Brake power and brake mean effective pressure (iii) Brake specific fuel consumption (iv) Brake thermal efficiency (iv) Indicated thermal efficiency.
13. Describe the combustion process in CI engine and how detonation occurs in it.
14. Write notes on water tube boiler with atleast one example.
15. Discuss and derive the thermal efficiencies of Carnot and Rankine cycles with the help of neat sketches.
16. In a steam nozzle, steam expands from 4 bar to 1 bar. The initial velocity is 60 m/s and initial temperature is  $200^\circ\text{C}$ . Determine the exit velocity if nozzle efficiency is 92%
17. Discuss on types of combustion chambers in SI and CI engines.