

FACULTY OF ENGINEERING**B.E. 3/4 (Mech.) I-Semester (Old) Examination, Nov. / Dec. 2016****Subject : Applied Thermodynamics****Time : 3 hours****Max. Marks : 75****Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.****PART – A** (10 x 2.5 = 25 Marks)

- 1 How does clearance volume help in the working of a reciprocating compressor?
- 2 What are the relative advantages of multi stage compressors over single stage compressor?
- 3 Define i) Brake thermal efficiency ii) indicated thermal efficiency
- 4 Define Carburation. What are the factors affecting the carburation?
- 5 Explain ignition delay in C.I. engine.
- 6 Explain the importance of indirect injection in C.I. engine briefly.
- 7 Write short notes on water tube boiler.
- 8 Define equivalent evaporation of boiler.
- 9 Define Nozzle efficiency.
- 10 Define Heat rate in Rankine cycle.

PART – B (50 Marks)

- 11 a) Mention important differences between i) single acting and ii) double acting reciprocating air compressors. 3
 b) A double acting, single stage reciprocating air compressor delivers $0.25 \text{ m}^3/\text{s}$ of air measured at 1.013 bar (abs) and 27°C , delivers at 7 bar (abs). The conditions at the end of induction stroke are pressure of 0.98 bar (abs) and temperature of 40°C . The clearance volume is 5% of stroke volume and the L/D is 1.3 : 1, while the compressor runs at 300rpm. Calculate i) the volumetric efficiency ii) cylinder dimensions iii) indicated power and iv) isothermal efficiency of this machine. Take index of compression and expansion to be 1.3. 7
- 12 a) Define i) Relative efficiency ii) Volumetric efficiency 4
 b) A six cylinder gasoline engine operates in the four stroke cycle. The bore of each cylinder is 80mm and the stroke 100mm. The clearance volume per cylinder is 70cc. At a speed of 4000 r.p.m. the fuel consumption is 20kg/hr and the torque developed is 150Nm. Calculate i) Brake power ii) Brake mean effective pressure iii) Brake thermal efficiency, If the calorific value of the fuel is 43000Kj/kg and iv) Relative efficiency on a brake power basis assuming the engine works on the cycle constant volume cycle $\gamma = 1.4$ for air. 6
- 13 a) Explain the Swirl type combustion chamber and pre combustion chamber in detail. 5
 b) Explain the phenomenon of knock in C.I. engine in detail. 5

- 14 a) Explain Benson boiler with a sketch. 6
b) Explain in detail natural draught and mechanical draught. 4
- 15 Explain the methods to improve Rankine cycle. 10
- 16 A regenerative system is added to a 5-MW steam power plant that operates on a simple ideal Rankine cycle. Steam enters into the inlet of the turbine at 5MPa and 673K and subsequently gets cooled to a saturated liquid at 5kPa in the condenser. A suitable portion of the steam is withdrawn from the turbine at 3MPa, and the remaining steam is expanded to the condenser pressure level. Then, the pressure of this steam is raised to 3MPa to get mixed with extracted steam from the turbine in an open feed water heater. Determine a) quality of steam at the exit of turbine b) net work output per unit mass, and c) thermal efficiency. 10
- 17 Write short notes on the following : 10
a) Inter coolers in reciprocating air compressor
b) Mist Lubrication system
c) Combustion phenomena in S.I. engine
