FACULTY OF ENGINEERING

B.E. 3/4 (Mech.) I – Semester (Suppl.) Examination, June / July 2015

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 (25 Marks)

1	Define isothermal and mechanical efficiencies of air compressors.	3
2	What is the purpose of intercooling of air?	2
3	Give any two general classification of engines and how they differ in principle.	2
4	Draw a neat sketch of timings of valves and state their silent features for C.I. engine.	3
5	How Auto-ignition occurs in S.I. engines?	2
6	Compare knocking phenomena in S.I. and C.I. engines.	3
7	State any three general classification of Boilers.	3
8	Define Boiler Efficiency and factor of evaporation.	2
9	State the limitations of Carnot cycle with neat sketch, as regard to thermal power plants.3	
10	What type of nozzle is used for compressible fluids and why?	2

PART – B (5x10 = 50 Marks)

11 (a) A single acting 14 cmx10cm reciprocating Air compressor having 4% clearance gives the following data from its performance test, suction pressure o bar gauge, suction temperature $20^{o}C$, barometer 76 cm of Hg, discharge pressure 5 bar gauge, discharge temperature $180^{o}C$, speed 1200 r.p.m. shaft power 6.247 kW, mass of air delivered 1.7 mg/min. Calculate a) the actual volumetric efficiency; b) indicated power; c) isothermal efficiency; d) mechanical efficiency and e) overall isothermal efficiency.

12 On a trial of a single-cylinder oil engine working on dual cycle, the following observations are made.
Compression ratio = 15; oil consumption = 10.2 kg/h; calorific value of fuel = 43890 kJ/kg; Air consumption = 3.8 kg/min; speed = 1900 r.p.m.; Torque on brake drum = 186 N-m; Quantity of cooling water used = 15.5 kg/min; temperature rise = $36^{o}C$; Exhaust gas temperature = $410^{o}C$; Room temperature = $20^{o}C$; C_p for exhaust gas = 1.17 kJ/Kg ^{o}K, calculate (i) Brake power; (ii) Brake specific fuel consumption   (iii) Brake thermal efficiency. Draw neat balance sheet on minute basis. 10

13 Write notes on: 10
(a) Magneto ignition system
(b) Zenith carburettors.

14 Explain surface condensers. 10

15 How can we improve thermal efficiency of Rankine cycle? Explain with neat sketches. Discuss on regenerative cycle. 10

16 On a reheat cycle, steam at 500°C expands in a H.P. turbine till it is saturated vapour, it is then reheated at constant pressure to 400°C and then expands in a L.P. turbine to 40°C. If the maximum moisture content is Limited to 15%. Find (a) the reheat pressure; (b) the pressure of steam at inlet to H.P. turbine; (c) the net work output; (d) cycle efficiency. Assume all ideal process.

17 Write short notes on: 10
   (a) Steam Nozzle
   (b) Air pollution from IC engines
   (c) Deviation of actual cycles from air standard cycles.

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