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E – 2289

Reg. No. : .....

Name : .....

**Third Semester B.Tech. Degree Examination, May 2018  
(2013 Scheme)**

**13.307 : THERMAL ENGINEERING (MU)**

Time : 3 Hours

Max. Marks : 100

**PART – A**

Answer **all** questions. **Each** question carries **2** marks.

**(10×2=20 Marks)**

1. Explain a method to improve Rankine cycle efficiency.
2. Define degree of reaction for a steam turbine.
3. Explain binary vapour cycle.
4. Sketch the ideal and actual value timing diagram of a petrol engine.
5. Define thermal efficiency and volumetric efficiency of an IC engine.
6. Define adiabatic flame temperature.
7. What do you understand by pre-ignition in IC engines ?
8. Briefly explain the advantages of fuel additives.
9. Sketch the Brayton cycle on P-V and T-S diagram.
10. What are the advantages of gas turbines over IC engines ?

P.T.O.



## PART – B

(4×20=80 Marks)

Answer **any one full** question from **each** Module. **All** questions carry **equal** marks.

**Module – I**

11. a) With a neat sketch explain the working of Cochran boiler.  
b) Standard steam flows through a nozzle and at some cross section the pressure is 35 bar and the velocity is 300 m/s. The final enthalpy of steam is 2090 KJ/Kg. Find the total properties and the final velocity of the steam.

OR

12. a) Explain with schematic sketches, the effect of reheating and regenerative heating on steam engine performance.  
b) Derive an expression for mass flow rate through a steam nozzle.

**Module – II**

13. a) Sketch diesel cycle on P-V and T-S diagram. Derive an expression for thermal efficiency for a diesel cycle.  
b) Explain the reasons for deviations of actual engine cycle from ideal engine cycle.

OR

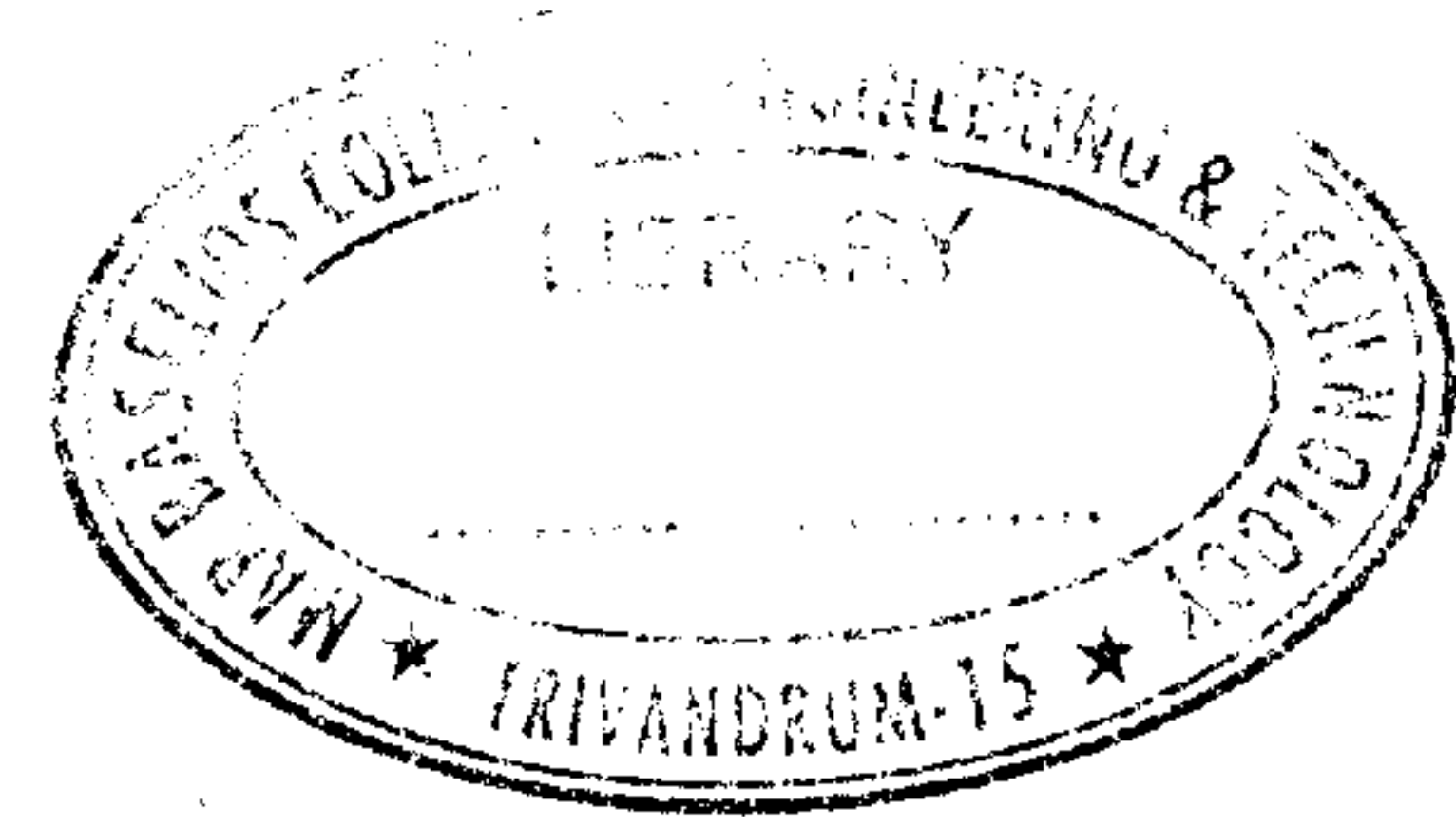
14. a) What is the difference between Otto and Diesel cycles ? Show that efficiency of a Diesel cycle is always lower than the efficiency of a Otto cycle for the same pressure ratio.  
b) Explain how heat balance test is conducted on an IC engine. Roughly draw the heat balance chart.

**Module – III**

15. a) Discuss the usage of LPG and CNG in SI engines.  
b) Explain the stages of combustion in CI engines. Explain the working of fuel pump/injection system in CI engines.

OR

16. Write short notes on  
i) Octane and cetane rating of fuel.  
ii) Alternative bio-fuels for IC engines.  
iii) Detonation.  
iv) Fuel additives.  
v) Knocking.



Module – IV.

17. a) Show that the efficiency of an ideal Brayton cycle depends only on the pressure ratio.
- b) In a gas turbine plant, operating on Joule cycle, air is compressed from 1 bar and  $15^\circ\text{C}$  through a pressure ratio of 6. It is then heated to 1000 K in combustion chamber and expanded back to a pressure of 1 bar. Calculate the work done, cycle efficiency and work ratio. Assume isentropic efficiencies of the turbine and compressor at 90 and 85 percent respectively.

OR

18. a) Discuss the advantages and disadvantages of gas turbines with IC engines.
- b) With schematic sketches how a gas turbine cycle is improved by
- i) Intercooling
  - ii) Reheating.
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