



Reg. No. : .....

Name : .....

**Combined First and Second Semester B.Tech. Degree  
Examination, March 2018  
(2013 Scheme)  
13.107 : BASIC MECHANICAL ENGINEERING (ACEFRT)**

Time : 3 Hours

Max. Marks : 100

PART – A

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

1. What is a thermodynamic property ? What are the methods of classifying properties ?
2. What is PMM2 ? State the second law of thermodynamics in terms of this device.
3. Distinguish between surface tension and capillarity.
4. Sketch the block diagram of the fuel system of a diesel engine.
5. List the differences between fire tube and water tube boilers with examples.
6. List the differences between Francis turbine and Kaplan turbine.
7. Differentiate between comfort air conditioning and industrial air-conditioning.
8. Sketch and name the parts of a single plate clutch.
9. What is the purpose of runner and riser in a casting ?
10. Write a short note on milling process.

PART – B

Answer **any one full** question from **each** Module. **Each** question carries **20** marks.

**Module – I**

11. a) State and explain the first law of thermodynamics for a closed system undergoing a cycle.



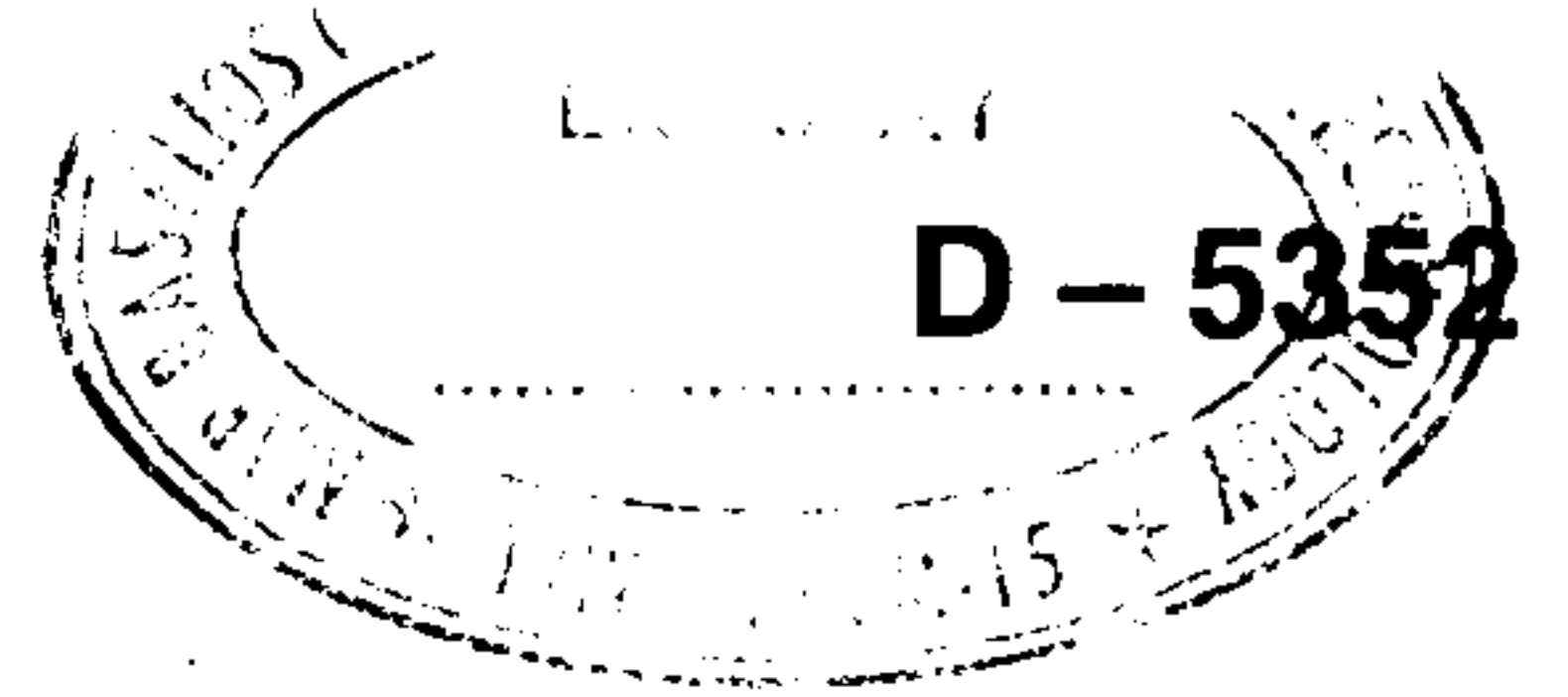
- b) Derive an expression for the air standard efficiency of Carnot cycle using TS diagram and justify the statement “Carnot cycle engine cannot be realized in practice”. 8
- c) An inventor claims to have developed an engine which takes 70 kJ/min of heat at a temperature of 1092°C, rejects heat at a temperature of 149°C and delivers 0.184 kW power. Would you suggest investing money to market this engine ? If not, why ? 6
12. a) State Newton’s law of viscosity and briefly explain its importance in the analysis of fluid flow. 4
- b) A pipe 200 m long has a slope of 1 in 100 and tapers from 0.2 m diameter at the upper end to 0.1 m diameter at the lower end. The flow rate of water through the pipe is 2100 litres per minute. If the pressure at the upper end is 400 kpa, find the pressure at the lower end. Neglect losses. 8
- c) Derive Euler’s equation of motion along a stream line and hence derive Bernoulli’s equation. 8

### Module – II

13. a) Draw the circuit diagram for the battery ignition system of a six cylinder petrol engine and explain. 6
- b) In a diesel cycle, air at 0.1 MPa and 300 k is compressed adiabatically until the pressure rises to 5 MPa. If 700 kJ/kg of energy in the form of heat is supplied at constant pressure, determine the compression ratio, cutoff ratio, thermal efficiency and mean effective pressure. 8
- c) Explain the working of a four stroke diesel engine. 6
14. a) Explain the working of a super critical boiler with a neat sketch. 8
- b) Explain the principle of working of a fluidized bed combustion boiler. 8
- c) Explain :  
 i) governing system of IC engines  
 ii) hybrid vehicles. 4

### Module – III

15. a) Explain the working of a reciprocating compressor. 7
- b) Derive an expression for the efficiency for a gas turbine cycle. 7
- c) Explain vapour compression refrigeration system with the help of ph and TS diagrams. 6



16. a) With the help of line sketches, explain the working of boiling water reactor and pressurized water reactor nuclear plants. **12**
- b) Make a comparative study of centrifugal and reciprocating pumps. **4**
- c) What is the function of draft tube in a reaction type hydraulic turbine ? What will happen if draft tube is not provided ? **4**

#### Module – IV

17. a) In a workshop, a motor running at 1400 rpm drives a main shaft using belt drive. The diameter of pulleys on the motor shaft and the main shaft are 300 mm and 500 mm respectively. A counter shaft in the workshop is driven by the main shaft by another belt drive for which the pulley diameters are 300 mm on the main shaft and 450 mm on the counter shaft. If there is 3% slip on each drive, determine the speed of the counter shaft. Neglect the thickness of belt. **10**
- b) Explain welding, soldering and brazing. **6**
- c) Describe the machining processes :
- i) turning
  - ii) taper turning
  - iii) thread cutting. **4**
18. a) Explain EDM and ECM with sketches. **8**
- b) Explain the principle of arc welding. Name some arc welding processes. **6**
- c) What are the advantages and disadvantages of :
- i) flat belt drive
  - ii) v belt drive
  - iii) rope drive
  - iv) wire drive. **6**
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