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**R16**

Code No: 135BP

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, December - 2019

AG AG AG THERMAL ENGINEERING - I AG AG A  
(Mechanical Engineering)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b as sub questions.

AG AG AG PART - A AG AG AG A

(25 Marks)

- 1.a) What is the function of fuel injection system in CI Engines? [2]
- b) Draw port timing diagram of a two stroke petrol engine. [3]
- c) List out different types of antiknock additives. [2]
- d) Draw a sketch of F Type combustion chamber? [3]
- e) Define positive displacement compressor. [2]
- f) How does frictional losses vary with speed in IC Engine. [3]
- g) Define polytropic efficiency in axial flow compressor. [2]
- h) What do you understand by slip in centrifugal compressor? [3]
- i) Define Tonne of Refrigeration. [2]
- j) What is the effect of COP in sub cooling process? [3]

AG AG AG PART - B AG AG AG A

(50 Marks)

2. Write the reasons why actual cycles are deviating from Air standard cycles. [10]

OR

- 3.a) With the aid of a sketch, explain the mixture requirements of an automotive engine. under

AG AG AG ii) Normal running - iii) Power range AG AG A  
i) Idling range  
b) Compare between battery Ignition and magneto Ignition regarding: [5+5]  
i) Quality of Spark ii) Maintenance

4. With the aid P-θ diagrams, explain the three stages of combustion in SI engine. And the four stages of combustion in CI engine. [10]

OR

AG AG AG What is cetane number? AG AG AG A  
b) What are the factors affecting the delay period in CI engine? [3+7]

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6. What are the instruments or equipment used for measuring the following parameters of an I.C. Engine.

- a) Brake power      b) No emissions      c) Air flow rate  
 d) Pressure of combustion gases      e) CO emissions.

[10]

OR

7. A single stage, single acting, reciprocating air compressor takes in air at 1 bar and 303°K. Air is discharged at 6 bar at a flow rate of 0.6 kg /min. The bore and stroke of the compressor are 100 mm and 150 mm respectively. Assume clearance factor as 0.03. The law of compression is  $PV^{1.3} = \text{Constant}$ . Take  $R=287 \text{ J/kg K}$ .

Calculate:

- a) Volumetric efficiency  
 b) Power required if mechanical efficiency is 85% and  
 c) Speed of the compressor.

[10]

8. In a centrifugal compressor, the air enters at 26°C and leaves at 98°C. The air is compressed through a pressure ratio of 3. Calculate the isentropic efficiency and power required by the compressor, if 28 kg of air is compressed per minute. Take  $C_p= 1 \text{ kJ/kg}^\circ\text{K}$  and  $C_v= 0.716 \text{ kJ/kg}^\circ\text{K}$ .

[10]

OR

9.a) Explain the working of Roots blower Air compressor with a sketch.

b) What is a centrifugal compressor? How does it differ from an axial flow compressor?

[5+5]

10. An air refrigeration open system working between 1Mpa and 100 kPa is required to produce a cooling effect of 2000kJ/min. The temperature of air leaving the cold chamber is -5°C and at leaving the cooler is 30°C. Neglect losses and clearance in the compressor and expander determine.

- a) Mass of air circulated per minute.  
 b) Compressor work, expander work and the cycle work.  
 c) COP and  
 d) Power required to drive the machine.

[10]

OR

11. A standard vapour compression refrigeration system using R-12 as the refrigerant operates between the condenser pressure of 10 bar and the evaporator pressure of 2 bar. The evaporator absorbs 75kJ/min of energy as heat and the vapour is dry at the exit of the compressor. Represent the cycle on P-V and T-s planes and calculate.

- a) Mass flow rate of refrigerant  
 b) Power consumed by the system  
 c) COP of the cycle and  
 d) Carnot cycle COP.

The properties of the R-12 is given below

[10]

Pressure (bar)	Saturation temperature °C	Enthalpy (kJ/kg)		Entropy (kJ/kg)	
		Liquid	vapour	Liquid	vapour
10	42	77	204	---	0.683
1.5	-20	17.85	178	0.074	0.709