Code No: 154CD **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year II Semester Examinations, February - 2024
THERMAL ENGINEERING – I
(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A
(25 Marks)

1.a)	List the main parts of a lubrication system.	[2]
b)	Write the qualities of an ideal ignition system.	[3]
c)	What is meant by cetane number?	[2]
d)	"Auto-ignition is the cause of detonation" Justify the statement.	[3]
e)	What do you mean by performance of IC engine?	[2]
f)	Evaluate the necessity of clearance in reciprocating compressors.	[3]
g)	What do you understand by a slip factor in dynamic compressors?	[2]
h)	Draw the velocity diagram of a centrifugal blower.	[3]
i)	Draw the T-s diagram of a reheat gas turbine cycle.	[2]
j)	List out the merits and demerits of closed and semi-closed cycle gas turbines.	[3]

PART – B
(50 Marks)

2. With the help of neat sketches, explain the following:
a) Evaporative cooling system b) Pressure cooling system [5+5]

OR

3.a) Explain the working of fuel injection system of CI engine.
b) Describe a battery ignition system with the help of a sketch. [5+5]

4.a) Bring out clearly the process of combustion in CI engines and also explain the various stages of combustion.
b) What is meant by abnormal combustion? Explain the phenomena of knock in SI engines. [5+5]

OR

5.a) What is ignition lag? Explain the factors effecting ignition lag.
b) Discuss about direct and indirect injection combustion chambers. [5+5]

6. Find the air –fuel ratio of a four strokes, single cylinder, air cooled engine with fuel consumption time for 0.1 m^3 is 16 sec. The load is 17 kg at a speed of 2500 rpm. Find also brake specific fuel consumption in kg/kWh and brake thermal efficiency. Assume the density of air as 1.2 kg/m^3 and specific gravity of fuel as 0.73. The lower heating value of fuel is 40MJ/kg and dynamometer constant is 5000? [10]

OR

7.a) Explain Willan's line method to find friction power of an IC engine.

b) Derive an expression for volumetric efficiency of a reciprocating compressor and discuss its physical significance. [5+5]

8.a) Explain the working of Root's blower with a neat sketch and derive the expression its efficiency.

b) Derive the expression for slip factor and pressure coefficient in case of centrifugal compressor. [5+5]

OR

9.a) Explain the working principle of axial flow compressor with a neat sketch.

b) Discuss the working of a vane sealed compressor. [5+5]

10. In a simple gas turbine plant, air enters at 1 bar and 20$_0$C and compressed with isentropic efficiency of 80% to 4bar. Then it is heated in combustion chamber with A : F ratio = 90:1. The Calorific value of a fuel used is 41.8 MJ/kg. If air flow is 3kg/sec, find the power developed and thermal efficiency by the plant. Take C_p= 1kJ/kg ^{0}C and ν = 1.4 for air as well as gas? [10]

OR

11.a) Sketch and explain the line diagram of a semi closed gas turbine plant.

b) Derive the expression of optimum pressure ratio for maximum network output in an ideal gas turbine cycle. [5+5]

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