Roll No:													

BTECH
(SEM. IV) THEORY EXAMINATION 2025-26
APPLIED THERMODYNAMICS

TIME: 3 HRS **M.MARKS: 70**

Note: Attempt all Sections. In case of any missing data; choose suitably.
Steam Table and Mollier Chart is allowed.

SECTION A

1. Attempt *all* questions in brief. **02 x 7 = 14**

Q no.	Question	CO	Level
a.	State the relationship between compression ratio and efficiency for an Otto cycle.	CO1	K2
b.	Define "Lower Heating Value" (LHV) of a fuel.	CO2	K2
c.	What is the function of a Fusible Plug in a boiler?	CO3	K2
d.	Define "Nozzle Efficiency."	CO4	K2
e.	Explain the term "Bleeding" in steam turbines.	CO5	K2
f.	Define "Work Ratio" in the context of a Gas Turbine cycle.	CO3	K2
g.	What is the difference between a Turbojet and a Turboprop engine?	CO3	K2

SECTION B

2. Attempt any *three* of the following: **07 x 3 = 21**

Q no.	Question	CO	Level
a.	A Diesel engine has a compression ratio of 16 and the heat addition at constant pressure occurs for 6% of the stroke. Determine the air-standard efficiency of the engine.	CO1	K3
b.	In a Rankine cycle, the steam at the inlet to the turbine is at 30 bar and 350^0C and the exhaust pressure is 0.5 bar. Determine the pump work and Rankine efficiency.	CO3	K3
c.	Explain the working of a Babcock and Wilcox boiler with a neat sketch.	CO3	K2
d.	Dry saturated steam at 10 bar is expanded in a nozzle to a pressure of 1 bar. If the expansion is isentropic, find the velocity of steam leaving the nozzle.	CO4	K3
e.	Discuss the velocity compounding of a multistage impulse turbine using a diagram showing velocity and pressure variations.	CO5	K2

SECTION C

3. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO	Level
a.	In a Dual cycle, the pressure and temperature at the beginning of compression are 1 bar and 15^0C. The compression ratio is 14. If the maximum pressure is limited to 55 bar and the heat added at constant volume is equal to that at constant pressure, find the efficiency.	CO1	K3
b.	Compare the performance of Superchargers and Turbochargers.	CO1	K2

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4. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	1 kg of Anthracite coal contains 90% Carbon, 3% Hydrogen, and 7% non-combustible matter. Calculate the minimum mass of air required for complete combustion.	CO2	K3
b.	Explain the "Exergy Analysis" of a Vapour Power cycle.	CO3	K2

5. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	A boiler generates 5000 kg of steam per hour at 10 bar and 200^{0}C from feed water at 40^{0}C. If the coal consumption is 600 kg/h (CV = 30,000 kJ/kg), find the Boiler Efficiency and Equivalent Evaporation.	CO3	K3
b.	Define "Draught" and derive an expression for the height of a chimney for maximum discharge.	CO3	K2

6. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	A single-stage impulse turbine has a mean blade speed of 200 m/s. Steam issues from the nozzle at 600 m/s at an angle of 16º. If the blades are equiangular, determine the blade angles and power developed for a steam flow of 5 kg/s.	CO5	K3
b.	Explain the phenomenon of stationary normal shock waves in convergent-divergent nozzles.	CO4	K2

7. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	In an ideal Brayton cycle, air enters the compressor at 1 bar and 300K. The pressure ratio is 6 and the maximum temperature is 1000 K. Calculate the thermal efficiency and specific work output.	CO3	K3
b.	Describe the working principle of a Liquid Propellant Rocket Engine.	CO3	K2