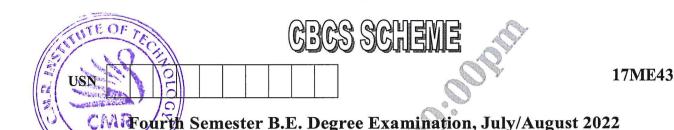
SANGALLINE



Time: 3 hrs. Max. Marks: 100

Applied Thermodynamics

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. 'se of thermodynamics data handbook is permitted.

Module-1

- a. With the help of P-V and T-S diagrams, derive an expression for the air standard efficiency of diesel-cycle. (10 Marks)
 - b. An air standard diesel cycle has a compression ratio of 18 and the heat transferred to the working fluid per cycle is 2000 kJ/kg. At the beginning of the compression stroke, the pressure is 1 bar and temperature is 300°K. Calculate the thermal efficiency. (10 Marks)

OR

- 2 a. With a neat sketch, explain the working principle of Ramjet engine. (10 Marks)
 - b. A gas turbine plant works between the temperature limits of 300°K and 1000°K and a pressure of 1 bar and 16 bar. The compression is carried out in two stages with perfect intercooling in-between. Calculate the netpower of the plant per kg of air circulation.
 C_p = 1 kJ/kg°K; γ = 1.4 for air.

Module-2

- 3 a. Discuss the effect of:
 - (i) Condenser pressure (ii) Boiler pressure performance of Rankine cycle. (10 Marks)
 - b. In a Rankine cycle, the maximum pressure of steam supplied is 6 bar. The dryness fraction is 0.9. The exhaust pressure is 0.7 bar. Find the theoretical work-done and Rankine efficiency.

 (10 Marks)

OF

- 4 a. With a schematic diagram, explain the working principle of reheat vapour cycle. (10 Marks)
 - b. Steam enters a steam turbine using reheat cycle at 150 bar, 350°C, the reheat pressure is 25 bar and exhaust pressure is 0.05 bar. The temperature of reheated steam is 300°C. Calculate the cycle efficiency and power developed for a steam flow rate is 3000 kg/hr. Consider the pump work.

 (10 Marks)

Module-3

- 5 a. Define the following terms with reference to a combustion process:
 - (i) Stiochiometric air
- (ii) Excess air
- (iii) Air-fuel ratio

- (iv) Enthalpy of formation
- (v) Combustion efficiency

(10 Marks)

b. A fuel has following composition by mass. C-82%, $H_2-13\%$ and remaining is oxygen. Calculate the minimum air required per kg of fuel for its complete combustion. Also calculate mass of product of combustion per kg of fuel. (10 Marks)

OR

(10 Marks)

6	a.	Define the following:	
		(i) Indicated power (ii) Brake power (iii) Friction power	
			l0 Marks)
	b.		
		Bore = 20 cm, stroke = 30 cm, speed = 350 rpm. Indicated mean	effective
		pressure = 275 kN/m^2 . Net brake load = 610 N , dia of brake drum = 1 m	m, oi
		consumption = 4.25 kg/hr, calorific value of fuel is 44,000 kJ/kg.	
		Determine: (i) I.P. (ii) B.P. (iii) η_{mech} (iv) Indicated thermal eff	iciency
		(v) Brake thermal efficiency (1	l0 Marks)
		Module-4	
7	a.	With a neat sketch, explain the working principle of vapour absorption refrigeration	system.
	1		lo Marks)
	b.		id leaves
		at 5.1 bar. Air enters the expander at 30°C. Find COP for the cycle. Calculate the	ie rate a
		which air must enter the compressor to produce a refrigerating effect of 1 ton refrige	iation. 1 0 Marks)
			io marks)
		OR	
8	a.	Define the following:	
•		(i) Dry bulb temperature (ii) Wet bulb temperature (iii) Dry air	
			l0 Marks)
	b.		
		(i) Sensible heating or cooling (ii) Dehumidification	
		(iii) Psychrometric chart (iv) Relative humidity	10 Marks)
Module-5			
9	a.	1 // / /	
	اد	1	10 Marks)
	b.	A single stage reciprocating compressor takes 1 m ³ of air per minute at 1.013 bar a	and 15°C
		and delivers it at 7 bar. Assuming that the law of compression is $PV^{1.35} = C$ and cle	arance is
		negligible. Calculate the indicated power. (1	10 Marks)
		OR	

10 a. Explain the following:

(i) Isentropic flow

(ii) Flow with friction

(iii) Super saturated flow

b. Air expands reversibly and adiabatically in a nozzle from 15 bar and 150°C to pressure of 7 bar. The inlet velocity of nozzle is very small and process occurs under steady state flow condition. Calculate the exit velocity of nozzle. (10 Marks)