(3 Hours) [Total Marks : 100

N.B. 1. Question no. 1 is compulsory.

2. Answer any **four** from the remaining **six** questions.

3. Assume suitable data wherever necessary.

4. Figure to the right indicates full marks.

Q1. Discuss and explain the following (any four)   20

(a) Need of air motor in condenser
(b) Condition for maximum discharge through nozzle
(c) Methods to improve efficiency of gas turbine
(d) Higher and lower calorific value of fuel
(e) Boiler accessories

Q2. (a) Following data is related to single stage impulse turbine: 12

Steam velocity	= 600 m/s
Blade speed	=250 m/s
Nozzle angle	=20°
Blade outlet angle	=25°

Neglecting friction calculate
(1) Inlet angle
(2) Axial thrust
(3) Power developed
(4) Blade efficiency

(b) Discuss velocity and pressure compounding for steam turbine   8

Q3. (a) The inlet and outlet temperatures of cooling water to condenser are 25° and 32°. If   10

Vacuum reading is 706 mm of mercury with barometer reading 760 mm. Calculate condenser

efficiency.

(b)Explain construction and working of Babcok & Wilcox boiler   5

(c) Differentiate between impulse turbine and reaction turbine   5

Q4. (a)Enumerate various uses of gas turbine and describe with neat sketch working of simple   10

Constant   pressure gas turbine.

(b) Distinguish between water tube boiler and steam tube boiler   5

(c) What do you mean by rotary and reciprocating air compressor? What do you mean by   5

[TURN OVER

Surging and choking of compressor?

Q.5 (a) Explain constructional features of various axial flow compressors   6

(b) A boiler produces 200 kg of steam per hour at 10 bar and 0.95 dry. Feed water is heated by an economizer to a temperature of 110 ° C. 225 Kg of coal of calorific value of 30100 kJ/kg is fired per hour. If 10% of coal is unburned, find the thermal efficiency of the boiler and boiler and grate combined. 14

Q.6 (a) A hydrocarbon (C_6H_{17}) has enthalpy of combustion -4856920 kJ/kg mole. Find value of it enthalpy of formation. Take enthalpy of formation of CO_2 and H_2O as 393791 and 288136

KJ/ kg mole.   10

 (b) Differentiate between steam generator and boiler.   5

 (c) Define the following: (1) Enthalpy of formation   5

        (2) Heat of combustion (3) Enthalpy and internal energy of reaction

        (4)Equivalent evaporation   (5) Efficiency of condenser

Q.7   Write short notes on following (any four)   20

        (a) Steam injector for feeding water to boiler

        (b) Uses of compressed air

        (c)High pressure boiler

        (d) Adiabatic flame temperature   (e) Cooling tower