



FINAL PAPER 1

EXTERNAL INTEGRATED SUMMATIVE ASSESSMENT (EISA)

OCCUPATIONAL CERTIFICATE: GAS TURBINE PROCESS CONTROLLER

SAQA ID: 118111

NQF LEVEL: 6

CREDITS: 360

CANDIDATE DETAILS													
Candidate Name and Surname:													
ID Number:													
Assessment Centre Name:													
Assessment Centre Registration Number:													
Assessor Name and Surname:													
Assessor Registration Number:													
Moderator Name and Surname:													
Moderator Registration Number:													
Date:													
Time:	09H00- 12H00				Duration:		1 Day (3 Hours)						

INSTRUCTIONS TO CANDIDATES

This question paper consists of 17 pages

Please read the questions carefully and then answer **ALL** the questions on the provided answer sheets.

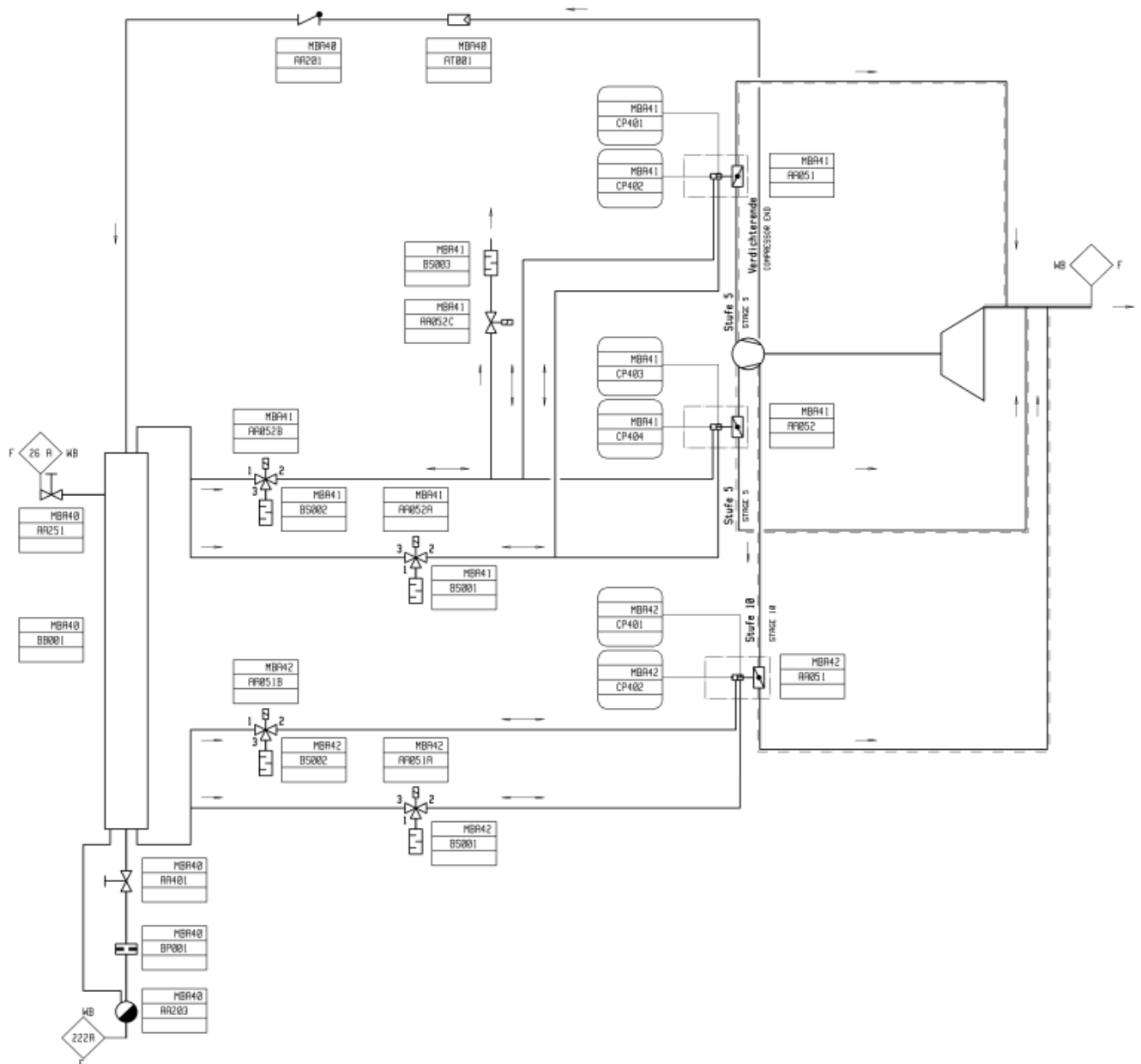
PLEASE ENSURE THAT YOU ADHERE TO THE FOLLOWING INSTRUCTIONS:

- Cell phones are not allowed.
- Please use a **BLACK PEN**. No script will be marked if written in Pencil.
- Complete all your personal details in the space provided above.
- This is a closed book assessment; no reference material will be allowed, unless otherwise indicated.
- Carefully read through all the Scenarios and Questions and answer **ALL** questions
- Diagrams/sketches must be large, neat and FULLY LABELLED
- Read the instructions for each question before answering.
- Structure all written answers logically.
- Pass mark for this assessment is 50%
- Use the mark allocation for each written question to guide the length of your answer.
- If additional paper is used, ensure that you write your Personal Details on each page and clearly mark which question you are answering.
- The invigilators will supply you with a stapler to attach the additional pages to the ANSWER SHEET

Question 1:

[16 marks]

1.1 Given the diagram (Blow-off system) provided below, analyse the and answer the questions that follow:



- a) Identify the different components that make up the Blow-off System. (6 marks)
- b) What is the function of the Blow-off system and the possible dangers to the Gas Turbine if components do not operate correctly? (4 marks)
- c) Using a P&I D diagram (Blow-off plant system given above), explain how the various Blow-off valves operate. (6 marks)

Scenario 1:

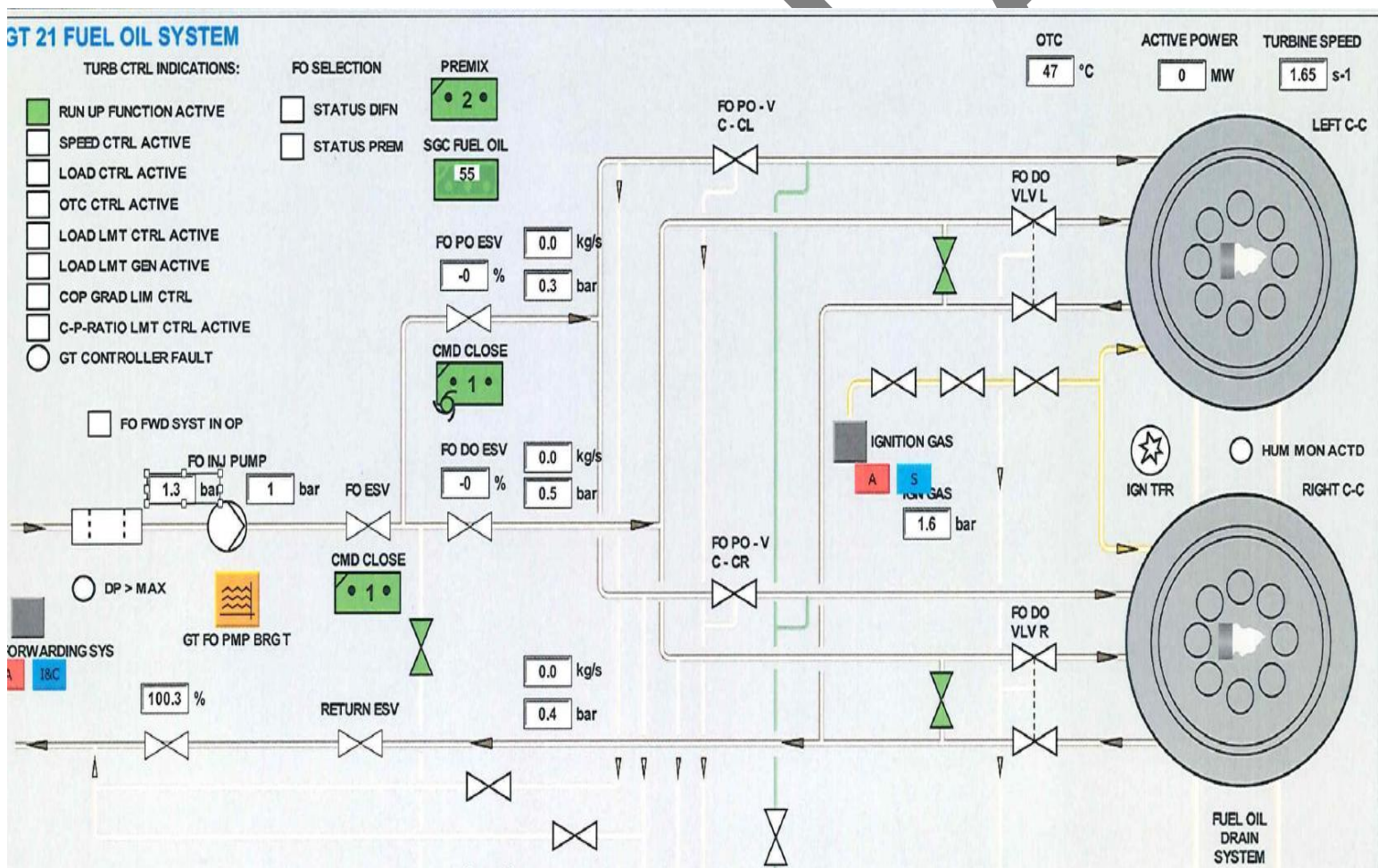
[12 marks]

- 1.2 Assume the unit is handed back to operations. You and your team are required to prepare the unit for stand-by for National Control. Assess and explain the role of the process controller highlighting communication with key stakeholders according to the standard operating procedures when the plant is ready to operate or cannot operate. (9 marks)

- b) Determine the activities involved using the system: _____ (3 marks)

Scenario 2:

- 1.3 Given the HMI schematic diagram, plant inspection sheet and relevant trends, analyse and interpret the data identifying any inaccuracies utilising the provided documentation. **[15 marks]**



Daily Operational Checks – UNIT 21								
	Ops Values	Mon.	Tues	Wed.	Thurs.	Fri.	Sat.	Sun.
Deluge Systems – SGA:								
Deluge Valve Control Pressure – SGF01CP501	> 6 Bar	7.16						
Deluge Valve Supply Pressure – SGF01CP502	> 6 Bar	7						
Deluge Foam Tank level – SGF01BB001	>75%	Yes						
Lube/Lift Oil – MBV:								
Level in tank OK MBV10CL001	Y/N	Yes						
Any oil in Sight Glass?	Y/N	NO						
C.W Outlet flow MBV	< 70 m3/h	65m3/h						
Oil Mist Separator Vacuum Press. MBV50CP101	neg -4 to -6 mbar	-512						
Lift Oil Filter in service	AT 01/02	01						
Lift Oil Pump Pres. MBV30CP502	> 130 Bar	150						
L.O. press. Before cooler and filter MBV21CP501	> 4 Bar	5						
L.O. press. After cooler and filter MBV28CP501	> 1.5 Bar	2						
L.O. Filter in service	AT 01/02	02						
Filter DP ok – MBV25CP001	% Red	0						
L.O. Cooler in service	AH 01/02	402						
L.O. temp. before cooler MBV23CT511/521	< 60°C	55°C						
L.O. temp. after cooler MBV23CT512/522	< 50°C	48°C						
L.O. press. Cooler inlet MBV23CP511/521	5-5.2 Bar	5.2						
CW press. Cooler inlet MBV23CP513/523	4.8-5 Bar	5						
Hydraulic Skid – MBX:								
MBX02 CP501	150-170Bar	160						
MBX06 CP501	>0 Bar	1						
MBX04 CP501	150-170Bar	160						
MBX04 CP502	150-170Bar	160						
MBX03 CP501	150-170Bar	-						
MBX02 CP502	150-170Bar	160						
Level in tank MBX01CL501	> 75 %	77.5%						
Temp. in Tank MBX01CT501	20-55°C	40°C						
Purge Water Skid – MBN:								
Tank Level OK	> 425 litre	Yes						
Ignition Gas stand – MBQ:								
Ign.Gas Pressure MBQ11CP502	9-15 Bar	1.6bar						
Leaks at Combustion Chamber Burners	Y/N	N						
Ign Gas Pipe Trace Heating	> 55 °C	75°C						
Fuel Oil Skid – MBN:								
F.O. Filter in service	AT 01/02	02						
Filter DP ok – MBN11CP001	% Red	0						
Pump Inlet Pressure MBN11CP501	> 4 Bar	1						
Pump Outlet Pressure MBN12CP501	100-120 Bar	0						
Pump Drive End Oil Level	> Red line	Yes						
Pump Drive End Bearing Temp MBN12CT105	< 85 °C	18°C						
Pump Non Drive End Oil Level	> Red line	Yes						
Pump Non Drive End Bearing Temp MBN12CT107	< 85 °C	20°C						
Premix Strainer DP - MBN16CP101	< 100 mBar	51						
Diffusion Strainer DP - MBN13CP104	< 100 mBar	2						
Main ESV Control filter indication- MBX78AT002	Red/Green	GREEN						
Premix ESV filter indication -MBX76AT002	Red/Green	GREEN						
Diffusion ESV filter indication-MBX75AT002	Red/Green	GREEN						
Return line ESV filter indication -MBX79AT002	Red/Green	GREEN						
Return line CV filter indication-MBX86AT002	Red/Green	GREEN						
Blow off & Combustion Chamber system : MBA & MBM								
Drain water condensate	Y/N							

1.4 Evaluate and integrate all resources required to control on the plan

- [16 marks]**

Diagram A

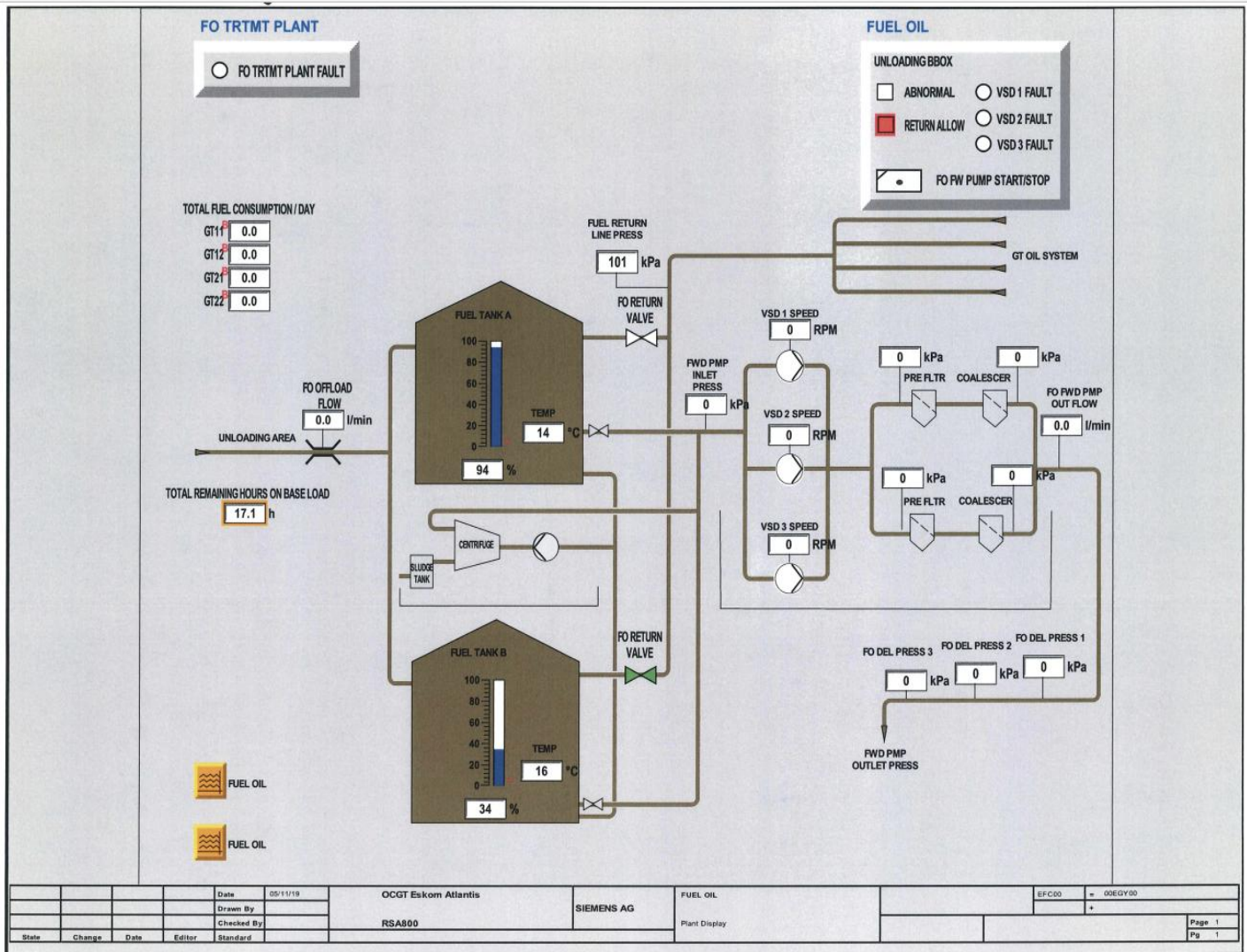


Diagram B

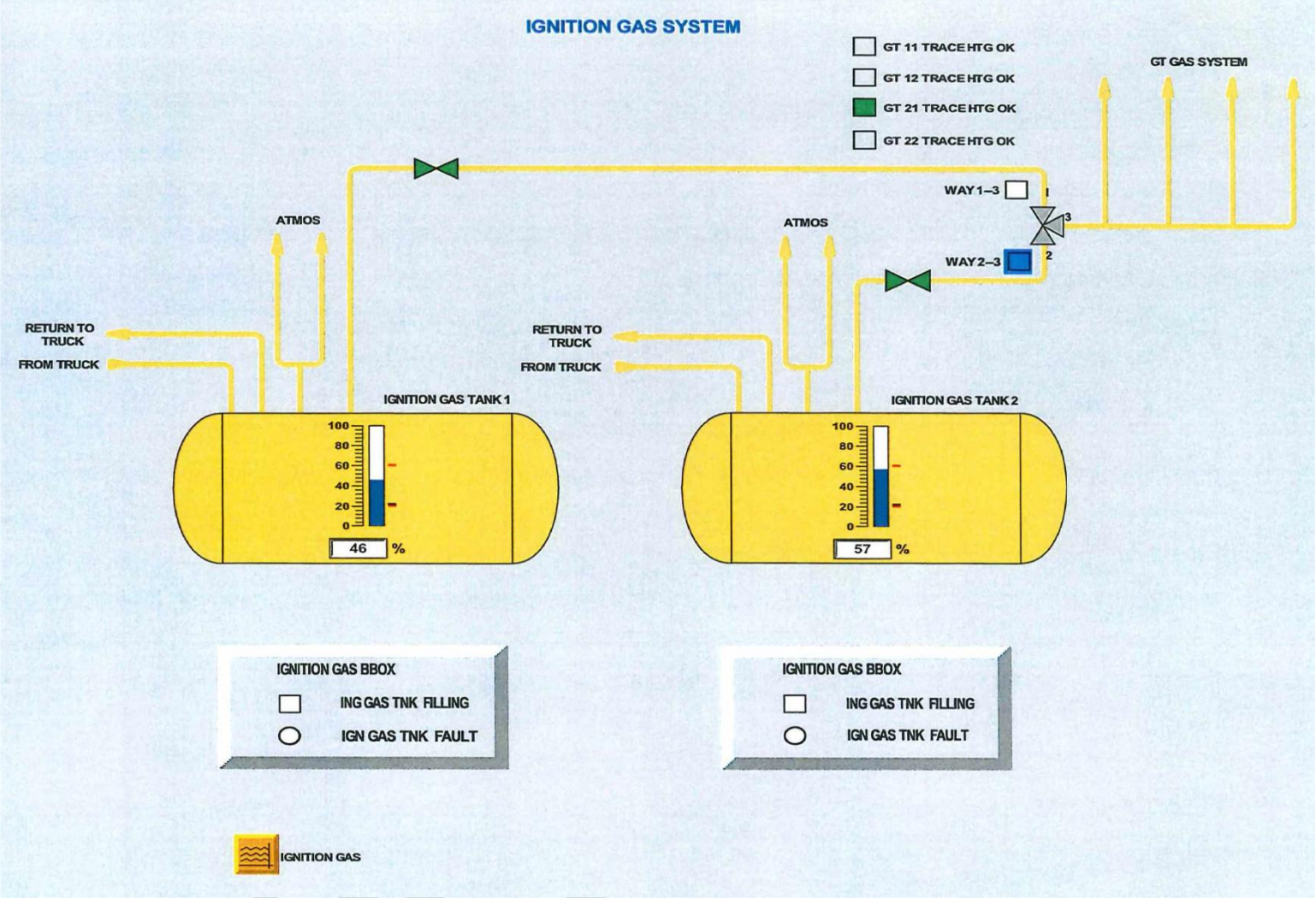
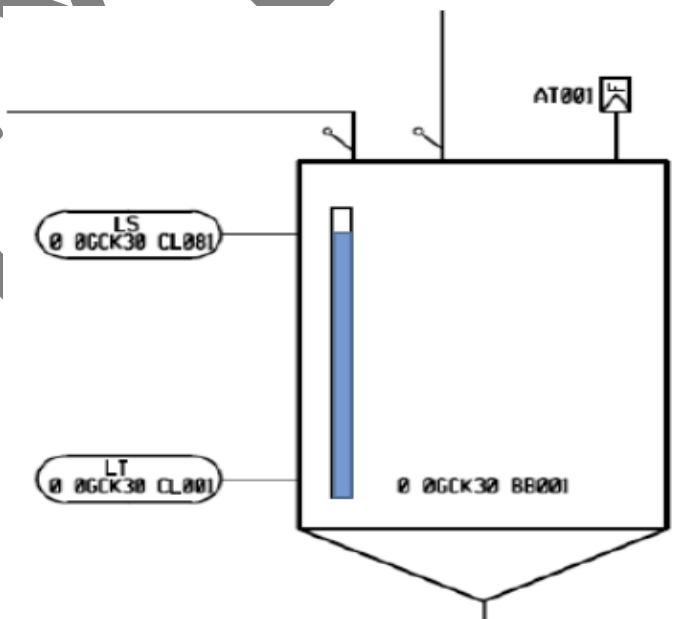


Diagram C



Scenario 3:

[6 marks]

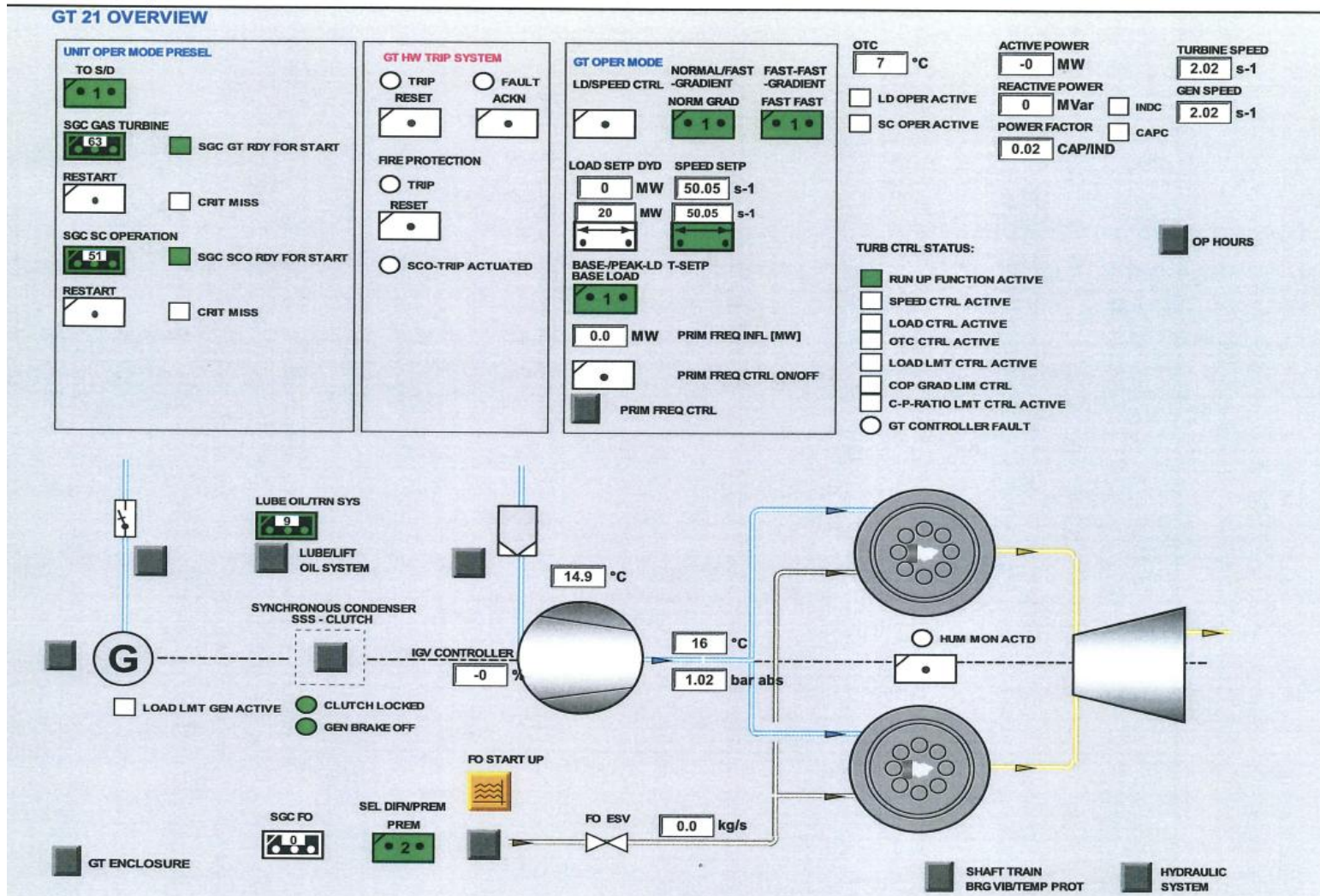
- 1.5 Given an out-of normal condition, explain the applicable steps to manage or troubleshoot the problem to avoid a risk to people, plant, production, or material.

EXEMPLAR

Question 2:

[30 marks]

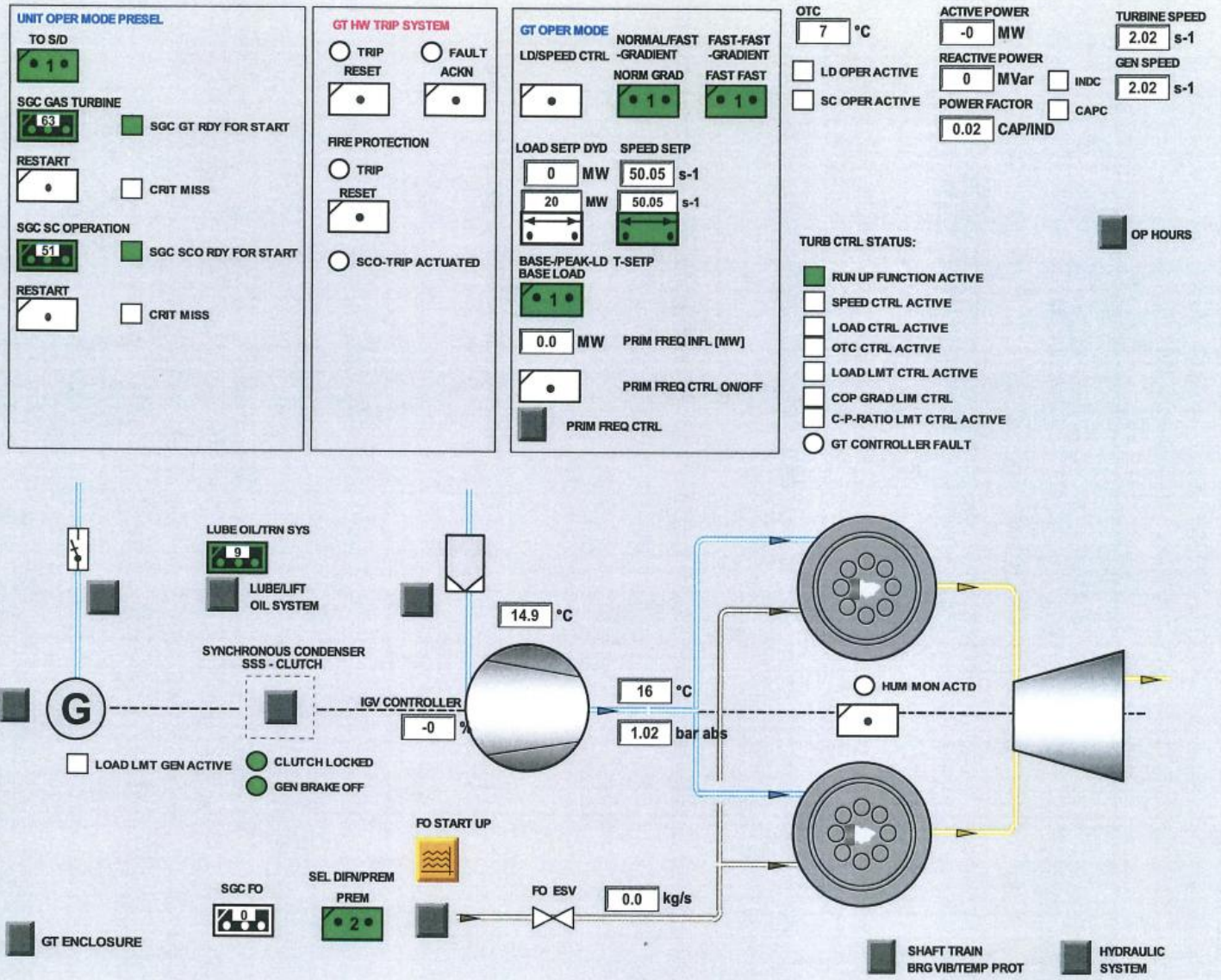
2.1 Analyse the diagram provided below (Diagram A: Turbine System) and answer the questions that follow:



a) Identify and explain the purpose of the major components of a gas turbine unit. (4 marks)

b) Analyse the diagram provided below and identify the inter-dependencies and the turbine plant status of the drawing provided considering the required temperatures, flow pressures and plant status on the diagram. (8 marks)

GT 21 OVERVIEW



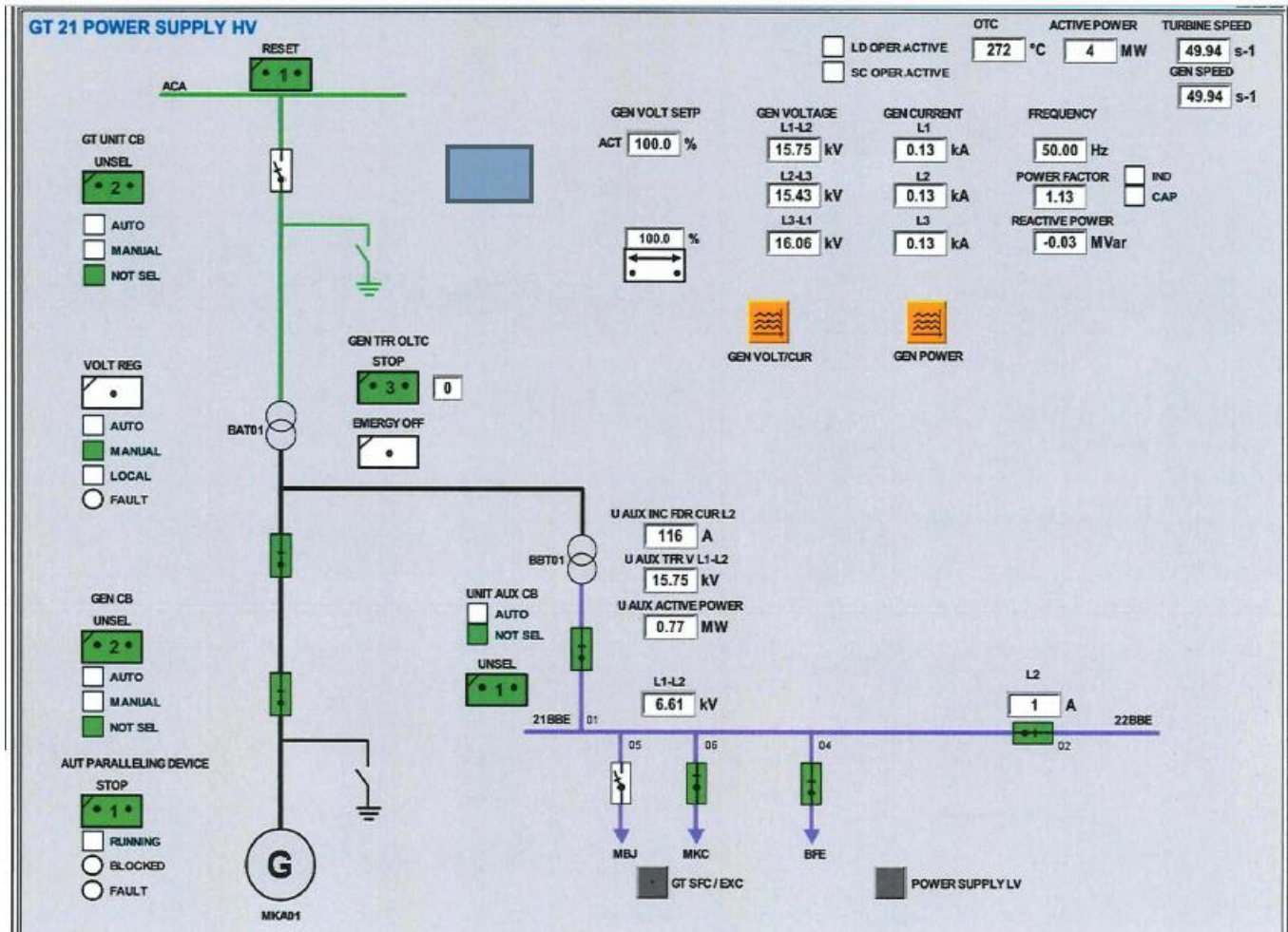
c) Explain the operating philosophy with respect to the utilisation of air from the intake through to the turbine. (12 marks)

d) Describe how you would log and communicate incidents and appropriate actions taken during normal, out-of-normal and emergency conditions according to the applicable standard operating procedures. (6 marks)

Question 3:

[8 marks]

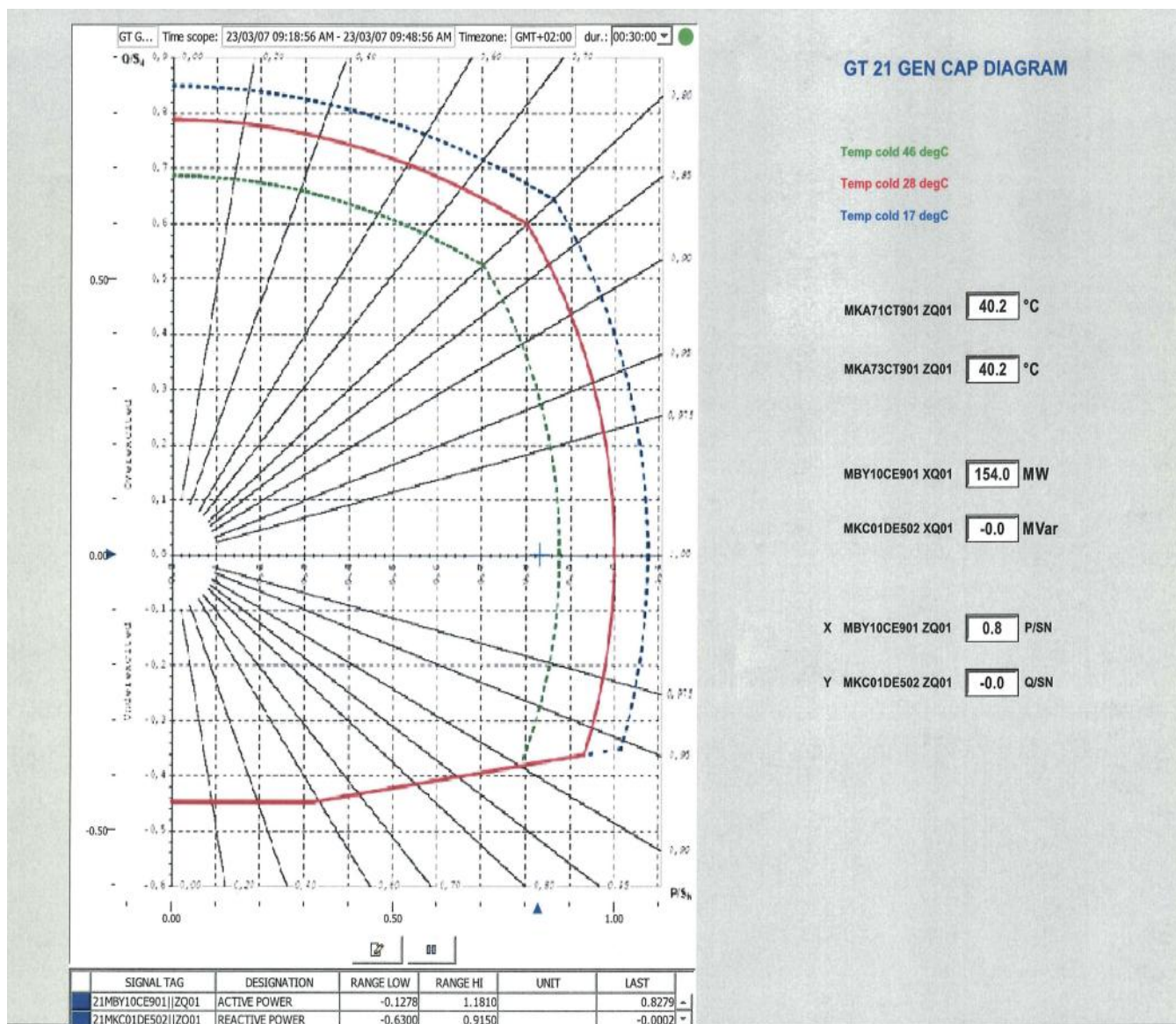
3.1 Examine and interpret the schematic layout below and explain the current status of the plant and explain how the flow of the current towards the busbars will be. Also indicate in your answer if there will be power supply to the busbars given current condition of the drawing.



Scenario 1:

[12 marks]

3.2 Given the diagram below, assume the National Control has commenced load shedding due to unavailability of coal plant units. The power factor is fast deteriorating, analyse and interpret the diagram and indicate what actions would you take to resolve the problem.



Scenario 2:

- 3.3 The temperature protection circuit of the compressor bearing has responded because one of the three temperature measurements are too high causing the gas turbine to trip. Evaluate and explain how you intervene to correct the situation. **[10 marks]**

Scenario 2:

[25 marks]

- 3.4 You are in a Control Room and an audible alarm is sounded indicating a fire incident that has occurred in the vicinity of the Combustion Chamber at a specific Unit. Given this scenario, please answer the following questions in response to the incident that has occurred:

- a) Explain what happens and the possible impact to production on a Gas Turbine Unit and indicate any Five (5) possible damages that may occur in case of fire in the vicinity of the Combustion Chamber. (5 marks)
- b) What appropriate actions would you take to address the problem? (20 marks)

TOTAL MARKS: / 150

END OF PAPER