

WESTINGHOUSE D501D5 QUIZ
POWER II - LOUISIANA DIVISION
RELIEF - PHIL PEVEY

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QUIZ 1

GENERAL

1. The main advantages of the gas turbine - waste heat boiler cycle over conventional boiler - steam turbine cycle are:
(List at least two)

2. What is the main difference in the heat cycle between Units 100/200 and Units 300/400?

3. What is the advantage gained by not having a regenerator on Units 300/400?

4. Answer the following:

	BBT Units	Westinghouse
Compressor Stages		
Turbine Stages		
No. of Combustors		
No. of Ignitors		
No. of Flame Scanners		
Bleed Valve Stages		

5. What are the purposes of the bleed valves? (Name two)

6. Starting at the one o'clock position and looking in the direction of flow on the Westinghouse Units, how are the combustors numbered?

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7. On ignition, how does the flame travel from combustor to combustor if there are only two ignitors?
8. What is the main purpose of the combustor primary air?
9. Most of the power developed by the gas turbine is consumed by the requirements of the compressor.
- True False
10. The total amount of air passing through the compressor increases as load is put on the main shaft.
- True False
11. Why does compressor discharge pressure increase as load increases?
12. When is a gas turbine most efficient - a full load, half load or no load? Why?
13. A pound of cool air takes up less space than a pound of warm air?
- True False

14. A gas turbine compressor can handle a larger flow of air if the inlet is cool or warm? Why?

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QUIZ 2

INLET GUIDE VANES

1. What is the main difference in the IGV's on the BBT Units and the Westinghouse Units?
2. What are some advantages of having variable IGV's?
(Name two)
3. The IGV's on the 501D5 are fully closed at:
100% 50% 37% 0%
4. The IGV's on the 501D5 are fully open at:
0% 100% 7% 50%
5. If IGV's are wide open, what effect does this have on exhaust temperature?
6. If IGV's opened fully while machine was at 80MW, what would be the effects? What would be necessary to compensate for the problem if the vanes could not be closed?
7. Why should you not leave the IGV controller on "manual" during normal turbine operation?

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8. What position should IGV's be in for startup? What happens to the IGV's on ignition during the start sequence? At synchronous speed, what is the position of the IGV's?

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QUIZ 3

TURBINE COOLING SYSTEM

1. What is the source of cooling air for the rotating blades?

2. First stage stationary vanes are cooled by air from the
_____.

3. Second stage vanes use _____ stage
compressor air for cooling.

4. Third stage vanes use _____ stage
compressor air for cooling.

5. Fourth stage vanes use _____ stage
compressor air for cooling.

6. Thermocouples (TC's) are installed to determine temperature
conditions within the disc cavities of the turbine. Where
are the TC's labeled DC2-1 and DC2-2 located? DC3-1 and
DC3-2? DC4-1 and 4-2? DC5?

7. The term "reference setting" refers to a pre-set curve in the
control logic that looks at compressor discharge pressure
and exhaust temperature. What happens if one of the two
disc cavity TC's in a disc cavity senses temperature higher
than the reference setting?

8. What happens if both disc cavity TC's sense high temperature?

9. What is the normal source of cooling water to the rotor air cooler?
10. During unit start-up when deaerator demand is low, how does the rotor cooler get enough water to satisfy demand?
11. If machine is to be brought up to speed only, is it necessary to have the deaerator unblocked? Why?
12. Explain the rotor cooling water control system including all controllers, alarms, pressure switches, etc.
13. If during normal operation, load drops suddenly and deaerator water demand drops drastically, will the deaerator level control valve close completely? Why? At what approximate rate will it maintain flow?
14. What initiates the deaerator level control over-ride?

15. If the deaerator level control over-ride takes over, where does the overflow water go?

16. If after startup and machine is a minimum load, you receive "rotor air temp. high" alarm and you notice that deaerator water is still blocked in, what should you do?

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QUIZ 4

CONTROL SYSTEM

1. The 501D5 has an automatic unload feature. What are the conditions that will activate this?

2. Can the operator halt the AUTO UNLOAD once it has been initiated? What stops the AUTO UNLOAD?

3. What is the sequence of events that will take place if the AUTO UNLOAD is not halted by the time the machine reaches minimum load?

4. If the AUTO UNLOAD lowers the machine to some point and then stops, how can you restore the load if:
 - 1) the machine has TEMPERATURE CONTROL selected?
 - 2) the machine has SPEED/LOAD CONTROL selected?

5. What are the conditions necessary to obtain a "READY TO START" light? (Assume the computer is down)

6. If the "AUXILIARIES RESET" lamp is not lit, what do you check?

- 4
7. If the "TRIP RESET" lamp is not lit, what do you do?
 8. If you want to bring the unit up to spin only, how do you stop the start sequence?
 9. How do you continue on with the start sequence after the SPIN HOLD?
 10. What are two reasons for never using the "Emergency Rate" pushbutton for a fast load drop?
 11. What takes place when the "Normal Stop" pushbutton is depressed?
 12. How can the "Normal Stop" sequence be aborted?
 13. How can load be restored after a "Normal Stop" sequence has been aborted?

14. What is the sequence of events when the "Steam Injection On" pushbutton is depressed?

15. If the machine is carrying some load and you decide to put on the steam injection, what would be the safest way to do this?

16. When would be the best time to select steam injection?

17. What actually controls the steam injection flow rate? What is the parameter being used to set the flow?

18. What means do you have for changing steam injection flow? How much can you change flow? What is the control parameter for the Dow steam injection controller?

19. If the Nox analyzer is out and you have the steam injection controller on Manual, what position should you have the controller in?

100%

50%

0%

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20. If the "Temperature Control Select" light is on under the pushbutton, does this mean the machine is on temperature control? If not, how can you tell when it is.
21. If you have pushed the "Speed Control Select" and you are loading the machine manually, what will prevent you from exceeding the exhaust temperature limits?
22. What megawatt load is considered MIN LOAD for control purposes?
23. How can you tell if the machine is in the MIN LOAD control mode?
24. If machine was coming up to speed and you wanted the unit to automatically come up to 4 MW and hold, how can you set this up?
25. In the above situation, how could you select automatic loading of the machine past MIN LOAD.

26. How could you set the machine up to automatically unload itself. Once you have initiated this, how can you stop?
27. What activates the "Fast Shutdown" lamp? How do you clear the light?
28. How do you clear the "Fast Shutdown" lamp? What activates this lamp?
29. An aborted start due to "Starting Device Failure? may be cause by:
30. What happens if no ignition takes place 150 seconds after initiation of a start sequence?
31. What does the annunciator "ACS trouble" mean? How can you tell where the problem is?

32. How do you change turbine speed during start-up?
How do you change load after synchronizing?
33. What is the source of torque converter fluid during startup? At what pressure?
34. What can activate the "Turbine Overspeed" alarm during the start sequence? (Speed below 30%)
35. What are the problems that will cause the "Lube System Trouble" annunciator to light?
36. If during startup, you receive "Turbine Acceleration Low" alarm, what does this mean and what could be the problem?
37. How do you put the machine in the temperature control mode from the speed control mode? What should you watch for when doing this?
38. What should you do when you get the "Blade Path TC open" annunciator.

39. There is a total of 14 blade path thermocouples. Seven TC's are used for control and seven are used for supervisory function. How many TC's can you null without shutting the machine down should they fail?
40. What are at least five (or more) functions of the blade path temperature monitor?
41. What happens when the blade path temperature spread exceeds 80° F? 120° F? 150° F?
42. How do you scan all blade path thermocouples on the blade path temperature monitor?
43. How do you read the average blade path temperature on the blade path temp. monitor?
44. Where are the 14 blade path TC's located?
45. Where are the exhaust gas TC's located?

46. The unit will trip if for any reason the blade path temperature average exceeds _____ ° F.

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QUIZ 5

FIRE PROTECTION EQUIPMENT

1. What is the primary fire protection system of GT 300 and 400?
2. Is Halon harmful to breath?
3. How does Halon extinguish a fire?
4. What activates the Halon system in the electrical package? In the mechanical package? In the turbine enclosure? At what temperature are they set?
5. What happens when the Halon system is activated in the turbine enclosure? In the electrical and/or mechanical package?
6. How do you manually discharge the Halon system?

7. What other system do we have for fire protection in the hot end hearing tunnel? How are each activated?

8. How do you reset the Halon system? Snuffing Steam? Dry chemical?

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QUIZ 6

INSTRUMENT AIR SYSTEM

1. What is the normal source of instrument and service air for GT 300 and 400?

2. Where is the main instrument air control valve located?

3. At what pressure is this regulator set?

4. Where is the point of origin for the instrument and service air supply on GT 300?

5. What are the two back-up sources of air for GT 300 and 400? Which comes in first? At what pressures do these back-up come in?

6. Are the instrument air systems for each GT (100/200/300/400) normally tied together?

7. Can all GT air supply systems back-up each other automatically?
8. Why is instrument air more critical for the Westinghouse Units than the Brown-Boveri Units?
9. Where is the portable air compressor emergency connection on GT 300 air system?
10. If you receive an "instrument air pressure low" alarm on GT 300, what should you do?

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QUIZ 7

LUBE OIL SYSTEM

1. Explain the normal flow path of the lube oil and seal oil systems including pumps (AC and DC), regulators, cooling and temperature control system, etc.

2. What are three functions of the lube oil system other than lube oil requirements of the turbine and generator?

3. How many oil coolers are there on GT 300/400? How many are normally in service? How can you tell which is in service? If one is out of service is both water and oil blocked?

4. How does the oil reservoir water detector work? What is the indication for water in the reservoir?

5. What is the correct procedure for switching lube oil pumps?

6. What is the source of torque converter oil? What is the pressure of this oil?
7. What is another function of this high pressure oil?
8. What is normal bearing oil header pressure? What maintains this pressure? Where do you read bearing oil pressure?
9. What is the normal seal oil differential pressure on GT-300/400?
10. What would you do if you got a low seal oil differential pressure alarm?
11. What should happen if seal oil pressure drops? What could be wrong?

12. How could you manually start the standby seal oil pump? Is it AC or DC? Where does the standby seal oil pump get its suction?
13. Where does the lube oil for the generator bearings drain?
14. How many vapor extractors are there? To what are they connected?
15. If the main vapor extractor fails and the standby cannot maintain reservoir vacuum, what could be wrong?
16. What is the sequence of events that take place if lube oil pressure begins to drop? What is the last resort source of lube oil?
17. What activates the DC emergency lube oil pump? How long will the machine run with the DC pump as the only source of oil supply? Why?

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QUIZ 8

SEAL OIL SYSTEM

1. What is the normal source of seal oil?

2. How many back-up sources are there?

3. What is the normal range of seal oil differential pressure?

4. At what pressure does the machine trip on low seal oil differential?

5. What is the normal range of seal oil temperature?

6. Under what conditions would the seal oil supply not be cooled oil?

7. Where are the vapor extractors located on the seal oil system?
8. How is oil level maintained in the defoaming tanks?
9. What could be the cause of "Defoam tank Level High" alarm?
Where can you check defoam tank level?
10. What could be the result of an extra high level in the defoam tank?
11. What controls the level in the seal oil drain tank?
12. What could be the result if the seal oil drain regulator malfunctioned and allowed more oil to flow out of the loop seal tank than is flowing in?

13. What will tell you if the above is occurring?
What can you do to correct it?

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QUIZ 9

HYDROGEN SYSTEM

1. What is the KVA rating and KW rating of Generator 300/400? What is rated amps?

2. Why should the GAS CHANGING SELECTOR switch be in the GAS CHANGING position when adding hydrogen to the generator?

3. How is machine gas purity determined on Generator 300/400?

4. Do you know how to vent the generator in event of an emergency?

5. Can the unit be started with the GAS CHANGING SELECTOR switch in the GAS CHANGING position? Why?

6. What is the purpose of the uncompensated density meter on the control board?

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QUIZ 10

EXCITATION SYSTEM

1. What type exciter does the Westinghouse generator have?
2. How many diodes does the exciter have? How can you tell if any have failed?
3. Where is the PMG located?
4. How is the exciter cooled?
5. What does the Minimum Excitation Limiter Operator do?
6. What does the Maximum Excitation Limiter Operator do?

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7. What does the Annunciator "Voltage Balance" mean?
8. What is the purpose of the NULL meter on the control board?
9. What does the annunciator "Voltage Regulator Loss of FCP" mean?
10. If the machine voltage regulator was on AUTO and you wanted to put it on MANUAL, how do you do this?
11. At what speed does the field breaker close on startup?
12. What turns the Synchroscope on?

13. What frequency is the scope looking at if the frequency selector is on "GEN"? System?

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