# Module 15, GAS TURBINE ENGINE.

**15.4 Engine Compressors.**

Q. 1. A bypass engine LP compressor.
A. supplies less air than is required for combusti15.4 Compressors
B. supplies more air than is required for combustion.
C. supplies only the required quantity for combustion.

Ans.- supplies more air than is required for combustion.

Explanation. By definition the bypass duct sends air around the combustion chamber.

Q. 2. How does a dual axial flow compressor improve the efficiency of a turbojet engine?.

A. The velocity of the air entering the combustion chamber is increased.
B. More turbine wheels can be used.
C. Higher compression ratios can be obtained.
Ans.- Higher compression ratios can be obtained.
Explanation. Jeppesen A&P Powerplant Textbook 3-13.

Q. 3. In a reverse flow system, the last stage of an axial flow compressor is often centrifugal. This is to.

A. provide initial turning of the airflow.
B. prevent compressor surge.
C. increase the temperature rise.
Ans.- provide initial turning of the airflow.
Explanation. Rolls Royce The Jet engine Page 5 refers.

Q. 4. What are the two main functional components in a centrifugal compressor?.
A. Bucket and expander.
B. Impeller and diffuser.
C. Turbine and compressor.
Ans.- Impeller and diffuser.
Explanation. Jeppesen A&P Powerplant Textbook 3-13.

Q. 5. A bypass ratio of 5:1 indicates that the bypass flow is.
A. equal to 1/5 of the hot stream.
B. five times the hot stream.
C. five times the cold stream.
Ans.- five times the hot stream.
Explanation. Rolls Royce The Jet Engine page 16/17 refers.

Q. 6. The stator vanes in an axial-flow compressor.

A. direct air into the first stage rotor vanes at the proper angle.
B. convert velocity energy into pressure energy.
C. convert pressure energy onto velocity energy.
Ans.- convert velocity energy into pressure energy.
Explanation. Rolls Royce The Jet Engine page 25 refers.

Q. 7. What units in a gas turbine engine aid in stabilisation of the compressor during low thrust engine operations?.
A. Bleed air valves.
B. Stator vanes.
C. Inlet guide vanes.
Ans.- Bleed air valves.
Explanation. Rolls Royce The Jet Engine page 31 refers.

Q. 8. What purpose do the diffuser vanes of a centrifugal compressor serve?.
A. To convert pressure energy into kinetic energy.
B. To increase the air velocity.
C. To convert kinetic energy into pressure energy.
Ans.- To convert kinetic energy into pressure energy.
Explanation. NIL.

Q. 9. During the high RPM range on an axial flow gas turbine engine, in what position are the variable intake guide vanes and bleed valves?.
A. At maximum swirl position, bleed valves open.
B. At minimum swirl position, bleed valves closed.
C. At maximum swirl position, bleed valves closed.
Ans.- At minimum swirl position, bleed valves closed.
Explanation. Rolls Royce The Jet Engine page 29-31 refers.

Q. 10. What is the purpose of the diffuser section in a turbine engine?.
A. To convert pressure to velocity.
B. To reduce pressure and increase velocity.
C. To increase pressure and reduce velocity.
Ans.- To increase pressure and reduce velocity.

Explanation. Jeppesen A&P Powerplant Textbook 3-20.

Q. 11. The fan speed of a twin spool axial compressor engine is the same as the.
A. low pressure compressor.
B. forward turbine wheel.
C. high pressure compressor.
Ans.- low pressure compressor.
Explanation. Jeppesen A&P Powerplant Textbook 3-18.

Q. 12. Bleed valves are normally spring loaded to the.

A. closed position.
B. open position.
C. mid-position.
Ans.- open position.
Explanation. Rolls Royce The Jet Engine Page 31 refers.

Q. 13. What is the function of the stator vane assembly at the discharge end of a typical axial flow compressor?.
A. To increase air swirling motion into the combustion chambers.
B. To direct the flow of gases into the combustion chambers.
C. To straighten airflow to eliminate turbulence.
Ans.- To straighten airflow to eliminate turbulence.
Explanation. Jeppesen A&P Powerplant Textbook 3-17.

Q. 14. In a turbine engine with a dual spool compressor, the low speed compressor.
A. always turns at the same speed as the high speed compressor.
B. seeks its own best operating speed.
C. is connected directly to the high speed compressor.

Ans.- seeks its own best operating speed.
Explanation. NIL.

Q. 15. What units in a gas turbine engine aid in guiding the airflow during low thrust engine operations?.
A. Stator vanes.
B. Bleed air valves.
C. Inlet guide vanes.
Ans.- Inlet guide vanes.
Explanation. NIL.

Q. 16. What is one purpose of the stator blades in the compressor section?.
A. Increase the velocity of the airflow.
B. Stabilize the pressure of the airflow.
C. Control the direction of the airflow.
Ans.- Control the direction of the airflow.
Explanation. Jeppesen A&P Powerplant Textbook 3-17.

Q. 17. Compressor stall is caused by.
A. a low angle of attack airflow through the first stages of compression.
B. rapid engine deceleration.
C. a high angle of attack airflow through the first stages of compression.
Ans.- a high angle of attack airflow through the first stages of compression.
Explanation. NIL.

Q. 18. What is used to aid in stabilization of compressor airflow?.
A. Variable guide vanes and/or compressor bleed valves.
B. Pressurization and dump valves.
C. Stator vanes and rotor vanes.
Ans.- Variable guide vanes and/or compressor bleed valves.
Explanation. NIL.

Q. 19. What is the primary factor which controls the pressure ratio of an axial flow compressor?.
A. Compressor inlet temperature.
B. Compressor inlet pressure.
C. Number of stages in compressor.
Ans.- Number of stages in compressor.
Explanation. NIL.

Q. 20. The non-rotating axial-flow compressor airfoils in an aircraft gas turbine are known as.
A. stator vanes.
B. bleed vanes.
C. pressurization vanes.
Ans.- stator vanes.
Explanation. NIL.

Q. 21. The purpose of a bleed valve, located in the beginning stages of the compressor is to.

A. vent some of the air overboard to prevent a compressor stall.
B. control excessively high RPM to prevent a compressor stall.
C. vent high ram air pressure overboard to prevent a compressor stall.
Ans.- vent some of the air overboard to prevent a compressor stall.
Explanation. NIL.

Q. 22. During the low RPM range on an axial flow gas turbine engine, in what position are the variable intake guide vanes and bleed valves?.
A. At maximum swirl position, bleed valves open.
B. At maximum swirl position, bleed valves closed.
C. At minimum swirl position, bleed valves closed.
Ans.- At maximum swirl position, bleed valves open.
Explanation. NIL.

Q. 23. The energy changes that take place in the impeller of a centrifugal compressor are.
A. pressure decrease, velocity decrease, temperature increase.
B. pressure increase, velocity decrease, temperature increase.
C. pressure increase, velocity increase, temperature increase.
Ans.- pressure increase, velocity increase, temperature increase.
Explanation. rolls royce book page 21.

Q. 24. What is the primary advantage of an axial flow compressor over a centrifugal compressor?.
A. High frontal area.
B. Greater pressure ratio.
C. Less expensive.
Ans.- Greater pressure ratio.
Explanation. NIL.

Q. 25. Compression occurs.
A. across stators and rotors.
B. across rotors.
C. across stators.
Ans.- across stators and rotors.
Explanation. Jepperson Gas Turbine Powerplants Page 3-24 refers.

Q. 26. Which of the following can cause fan blade shingling in a turbofan engine?.
A. Large, rapid throttle movements and FOD.
B. Engine over temperature, large, rapid throttle movements and FOD.
C. Engine overspeed and large, rapid throttle movements.
Ans.- Large, rapid throttle movements and FOD.
Explanation. NIL.

Q. 27. Severe rubbing of turbine engine compressor blades will usually cause.
A. cracking.
B. bowing.
C. galling.
Ans.- galling.
Explanation. Jeppesen A&P Powerplant Textbook 4-25.

Q. 28. Which two elements make up the axial flow compressor assembly?.
A. Rotor and stator.
B. Stator and diffuser.
C. Compressor and manifold.
Ans.- Rotor and stator.
Explanation. NIL.

Q. 29. If the RPM of an axial flow compressor remains constant, the angle of attack of the rotor blades can be changed by.
A. changing the compressor diameter.
B. changing the velocity of the airflow.
C. increasing the pressure ratio.
Ans.- changing the velocity of the airflow.
Explanation. NIL.

Q. 30. The gas turbine Compressor Pressure Ratio is.

A. Compressor inlet pressure divided by Compressor discharge pressure.
B. Mass of air bypassing the combustion system divided by Mass of air going through the combustion system.
C. Compressor discharge pressure divided by Compressor inlet pressure.
Ans.- Compressor discharge pressure divided by Compressor inlet pressure.
Explanation. NIL.

Q. 31. An advantage of the centrifugal flow compressor is its high.
A. ram efficiency.
B. pressure rise per stage.
C. peak efficiency.

Ans.- peak efficiency.
Explanation. NIL.

Q. 32. The compression ratio of an axial flow compressor is a function of the.
A. number of compressor stages.
B. air inlet velocity.
C. rotor diameter.
Ans.- number of compressor stages.
Explanation. NIL.

Q. 33. Jet engine turbine blades removed for detailed inspection must be reinstalled in.
A. the same slot.
B. a specified slot 180°away.
C. a specified slot 90°away in the direction of rotation.

Ans.- the same slot.
Explanation. Jeppesen A&P Powerplant Textbook 4-25.

Q. 34. The procedure for removing the accumulation of dirt deposits on compressor blades is called.

A. the purging process.
B. the soak method.
C. field cleaning.
Ans.- field cleaning.
Explanation. NIL.

Q. 35. The two types of centrifugal compressor impellers are.
A. impeller and diffuser.
B. single entry and double entry.
C. rotor and stator.
Ans.- single entry and double entry.
Explanation. NIL.

Q. 36. Between each row of rotating blades in a compressor, there is a row of stationary blades which act to diffuse the air. These stationary blades are called.

A. stators.
B. rotors.
C. buckets.
Ans.- stators.
Explanation. NIL.

Q. 37. Bleed valves are.
A. closed at low RPM.
B. always slightly open.
C. closed at high RPM.
Ans.- closed at high RPM.
Explanation. Jeppesen Gas Turbine Powerplants Page 8-7 Refers.

Q. 38. Compressor field cleaning on turbine engines is performed primarily in order to.
A. prevent engine oil contamination and subsequent engine bearing wear or damage.
B. prevent engine performance degradation, increased fuel costs, and damage or corrosion to gas path surfaces.
C. facilitate flight line inspection of engine inlet and compressor areas for defects or FOD.
Ans.- prevent engine performance degradation, increased fuel costs, and damage or corrosion to gas path surfaces.
Explanation. NIL.

Q. 39. If the LP compressor shaft severed.
A. the LP turbine will speed up and the LP compressor will slow down.
B. the LP compressor of cruise thrust.
C. the HP compressor will slow down.
Ans.- the LP turbine will speed up and the LP compressor will slow down.
Explanation. The LP Turbine is attached to the LP compressor.

Q. 40. An advantage of a centrifugal compressor is.

A. it is dynamically balanced.
B. it is unaffected by turbulence.
C. it is robust and can stand some shock from icing-up.

Ans.- it is robust and can stand some shock from icing-up.
Explanation. Rolls Royce The Jet Engine Page 19 Refers.

Q. 41. Variable inlet guide vanes prevent.
A. compressor runaway.
B. engine flame out at high speed.
C. compressor stalling.
Ans.- compressor stalling.
Explanation. Jeppesen Gas Turbine Powerplant Page 8-1 Refers.

Q. 42. An axial flow compressor surges when.

A. later stages are stalled.
B. all stages are stalled.
C. early stages are stalled.
Ans.- all stages are stalled.
Explanation. The definition of a surge is when all stages are stalled and flow reversal occurs.

Q. 43. As a consequence of tapping air from the compressor, the TGT will.
A. fall.
B. remain constant.
C. rise.
Ans.- rise.
Explanation. When a bleed valve opens it is always accompanied by a rise in TGT of 15-30 degrees.

Q. 44. Compressor air bleeds promote the flow of air through the early stages by.
A. opening to allow air in.
B. closing.
C. opening to allow air out.
Ans.- opening to allow air out.
Explanation. Jeppesen Gas Turbine Powerplant Page 8-7 refers.

Q. 45. .Compressor blades have a reduced angle of attack at the tips.
A. to prevent turbine stall.
B. to increase the velocity.
C. to allow uniform axial velocity.
Ans.- to allow uniform axial velocity.
Explanation. Jeppesen Gas Turbine Powerplant Page 3-16 refers.

Q. 46. Compressor surge is caused by.
A. over fuelling.
B. rapid closing of the throttle.
C. prolonged engine running at high RPM.
Ans.- over fuelling.
Explanation. Jeppesen Gas Turbine Powerplant Page 3-26 refers to fuel system malfunction - over fuelling.

Q. 47. Pressure rise across a single spool axial flow compressor is in the order of.
A. four to one.
B. two to one.
C. up to fifteen to one.
Ans.- up to fifteen to one.
Explanation. Rolls Royce The Jet Engine page 15 refers.

Q. 48. What purpose do the diffuser vanes of a centrifugal compressor serve?.
A. To convert pressure energy into kinetic energy.
B. To increase the air velocity.
C. To convert kinetic energy into pressure energy.
Ans.- To convert kinetic energy into pressure energy.
Explanation. NIL.

Q. 49. The purpose of the rotating guide vanes on a centrifugal compressor is to.
A. direct the air smoothly into the impeller.
B. provide initial diffusing of the air.
C. prevent damage by solid objects.
Ans.- provide initial diffusing of the air.
Explanation. Rolls Royce The Jet Engine page 21 refers.

Q. 50. What is the surge margin of an axial flow compressor?.
A. The margin between the compressor working line and the surge line.
B. The margin between minimum and maximum pressure ratio obtained at constant RPM.
C. The margin between the stall condition and the surge condition.
Ans.- The margin between the compressor working line and the surge line.
Explanation. Rolls Royce The Jet Engine figure 3-14 refers. (See the 'safety margin').

Q. 51. The compression ratio of a jet engine is.

A. the compressor outlet pressure divided by the number of compressor stages.
B. the ratio between turbine pressure and compressor outlet pressure.
C. the ratio between compressor outlet pressure and compressor inlet pressure.
Ans.- the ratio between compressor outlet pressure and compressor inlet pressure.
Explanation. The higher the ratio the more efficient the engine.

Q. 52. Variable inlet guide vanes help to prevent.

A. compressor runaway.
B. ice build up on compressor blades.
C. compressor stalling.
Ans.- compressor stalling.
Explanation. Rolls Royce The Jet Engine page 28 refers.

Q. 53. Air through the compressor, before entering the combustion chamber, passes.
A. through divergent passage to increase the pressure.

B. through nozzles to increase the velocity.
C. through divergent passage to decrease the pressure.

Ans.- through divergent passage to increase the pressure.
Explanation. All compressor blades and stators are divergent, and all increase pressure.

Q. 54. Low mass airflow through a compressor will produce.
A. stalling of rear stages.
B. stalling of early stages.
C. no effect.
Ans.- stalling of early stages.
Explanation. Jeppesen Aircraft Gas Turbine Powerplant Page 3-25 refers.

Q. 55. A bleed valve.
A. relieves compressor choking at low RPM.
B. controls air intake pressure.
C. bleeds air from compressor for intake deicing.
Ans.- relieves compressor choking at low RPM.
Explanation. Rolls Royce The Jet Engine Page 29 refers.

Q. 56. If a compressor has a compression ratio of 9:1 and an intake compression of 2:1, what is the overall compression ratio?.
A. 9:1 intake compression does not add to the overall compression ratio of the system.
B. 18:1.
C. 11:1.
Ans.- 18:1.
Explanation. Jeppesen Aircraft Gas Turbine Powerplant Page 3-20 refers.

Q. 57. A compressor stage stalls when.
A. adiabatic temperature rise is too high.
B. compression ratio is too high.
C. smooth airflow is disrupted.
Ans.- smooth airflow is disrupted.
Explanation. Jeppesen Aircraft Gas Turbine Powerplant Page 3-25 refers.

Q. 58. Inlet guide vanes are fitted to.
A. control the quantity of air entering the intake.
B. guide the airflow onto the turbine rotor first stage.

C. control the angle of airflow into the compressor.
Ans.- control the angle of airflow into the compressor.

Explanation. Jeppesen Aircraft Gas Turbine Powerplant Page 3-24 refers.

Q. 59. Why, in an axial flow compressor is the cross sectional area of the compressor air duct reduced at each stage?.
A. To decrease the velocity of the air rising under pressure.
B. To maintain the velocity of the air under rising pressure.
C. To permit stronger, shorter blades to be used in the later stages.
Ans.- To maintain the velocity of the air under rising pressure.
Explanation. Jeppesen Aircraft Gas Turbine Powerplant Page 3-24 refers.

Q. 60. An abradable lining around the fan is to.

A. provide less leakage for anti-icing.
B. prevent fan blade tip rub.
C. strengthen the EPR value.
Ans.- strengthen the EPR value.
Explanation. Prevents fan blade tip losses.

Q. 61. Allowable damage on the first stage compressor blade is restricted to.
A. middle third of the blade to the outer edge.
B. outer third of the blade to the outer edge.
C. root end of the blade.
Ans.- middle third of the blade to the outer edge.
Explanation. Jeppesen Gas Turbine Powerplants Page 5-20 refers.

Q. 62. Tip speed of a centrifugal compressor can reach.
A. Mach 1.3.
B. Mach 1.0.

C. Mach 0.8.
Ans.- Mach 1.3.
Explanation. Jeppesen Aircraft Gas turbine Powerplant Page 3-11.

Q. 63. What is the profile of a compressor blade?.

A. A cutout that reduces blade tip thickness.
B. The leading edge of the blade.
C. The curvature of the blade root.
Ans.- A cutout that reduces blade tip thickness.
Explanation. Jeppesen A&P Technician Propulsion Textbook 3-16.

Q. 64. The resultant velocity of air exiting an axial compressor stage depends upon.
A. aircraft forward speed.
B. compressor RPM.
C. Both of the above.
Ans.- Both of the above.
Explanation. Jeppesen Aircraft Powerplant Page 3-23 Refers.

Q. 65. What is a compressor stage?.
A. One compressor rotor and one nozzle guide vane.
B. One rotor plus one stator.
C. One Nozzle Guide Vane and one rotor.
Ans.- One rotor plus one stator.
Explanation. Rolls Royce The Jet Engine Page 25 refers.

Q. 66. If the bypass ratio is 0.7:1, the 0.7 pounds of air is.
A. fed into H.P compressor compared to 1 pound fed around it.
B. fed around the engine to 1 pound fed into H.P. compressor.
C. bypassed for every 1 pound at the intake.
Ans.- fed around the engine to 1 pound fed into H.P. compressor.
Explanation. Jeppesen Aircraft Gas Turbine Powerplant Page 2-9 refers.

Q. 67. Advantage of an axial flow over a centrifugal flow gas turbine engine.
A. power required for starting is less.
B. low weight.
C. high peak efficiencies.
Ans.- high peak efficiencies.
Explanation. Rolls Royce The Jet engine page 21 shows how higher compression ratios (axial flow compressors) give lower SFC. Which means higher efficiency.

Q. 68. Compressor blades reduce in length.

A. from tip to root to maintain uniform velocity in compressor.
B. from L.P to H.P section to maintain uniform velocity in compressor.
C. from root to tip to maintain correct angle of attack.

Ans.- from L.P to H.P section to maintain uniform velocity in compressor.
Explanation. Rolls Royce The Jet Engine Page 22 refers.

Q. 69. Deposit build-up on compressor blades.

A. airflow is too fast for deposits to build up.
B. will not decrease efficiency but may cause corrosion.

C. can decrease compressor efficiency and cause corrosion.
Ans.- can decrease compressor efficiency and cause corrosion.
Explanation. Jeppesen Aircraft Gas Turbine Powerplant page 5-4 refers.

Q. 70. The diffuser after the compressor, before the combustion chamber.
A. increases velocity, decreases pressure.
B. decreases velocity, pressure increases.
C. increases velocity, pressure remains constant.
Ans.- decreases velocity, pressure increases.
Explanation. Assuming this refers to a centrifugal compressor see figure 3-6 Rolls Royce The Jet Engine.

Q. 71. In a compressor, diffusion action takes place across.
A. rotors.
B. rotors and stators.
C. stators.
Ans.- rotors and stators.
Explanation. Stators and rotors in compressors both form divergent ducts hence they both diffuse.

Q. 72. The ring of fixed blades at the intake of an axial flow compressor are called.

A. inlet guide vanes.
B. first stage stator blades.
C. first stage diffuser blades.
Ans.- inlet guide vanes.
Explanation. The fixed IGV's precede the 1st stage rotor which is in front of the 1st stage stator.

Q. 73. What is the purpose of pressure balance seal?.

A. To ensure the location bearing is adequately loaded throughout the engine thrust range.
B. To ensure LP compressor is statically balanced.
C. To ensure HP compressor is dynamically balanced.
Ans.- To ensure the location bearing is adequately loaded throughout the engine thrust range.
Explanation. Pressure balance seals oppose the tendency of compressors to move forward.

Q. 74. The optimum air speed for entrance into the compressor is approximately.
A. same as aircraft speed.
B. Mach 0.4.
C. Mach 1.
Ans.- Mach 0.4.
Explanation. Diffusion in the intake reduces the speed to 500ft/second (about mach 0.4).

Q. 75. What is the acceptable damage on stator blades that have been blended?.
A. One third along from root to tip.
B. One third from tip to root.
C. One third chord wise.
Ans.- One third from tip to root.
Explanation. The root of the blade has tighter tolerance than the tip, and chord wise indentations are also critical so our best guess is from tip to root

Q. 76. With regard to compressor blades, which of the following is true? No damage is permissible on.

A. a shroud fillet area.
B. the lip of a blade.
C. the last third of the outboard leading edge.
Ans.- a shroud fillet area.
Explanation. Shroud fillets are critical areas whereas the outer third of the blade is less so. Unshrouded tips are also less critical than shroud fillets.

Q. 77. Identify a function of the cascade vanes in a turbojet engine compressor section.

A. To remove air swirl before the combustion chamber.

B. To direct the flow of air to strike the turbine blades at a desired angle.
C. To decrease the velocity of air to the combustor.
Ans.- To remove air swirl before the combustion chamber.
Explanation. Jeppesen Aircraft Gas Turbine Powerplants page 3-23 describe the axial flow compressor as 'containing sets of airfoils in cascade'. It further says that the last stage of stationary vanes, called exit guide vanes turn the airflow back to an axial direction on its way to the combustor.

Q. 78. The pressure ratio can be influenced by.

A. compressor inlet temperature.
B. number of stages in compressor.
C. compressor inlet pressure.
Ans.- number of stages in compressor.
Explanation. Compressors are rated by their pressure ratio, the more stages the greater the pressure ratio.

Q. 79. Air bleed valves are.
A. closed at low RPM.
B. open at high RPM.
C. open at low RPM.
Ans.- open at low RPM.
Explanation. Air bleed valves reduce the pressure developed in a compressor until the speed is increased towards the blade design speed.

Q. 80. The compressor case annulus is.
A. convergent.
B. divergent.
C. parallel.
Ans.- convergent.
Explanation. All axial flow compressor case annulus are convergent to maintain a constant axial velocity through the compressor.

Q. 81. If the tip clearance in a centrifugal compressor is too small.
A. there would be pressure losses through leakage.
B. there is danger of seizure.
C. aerodynamic buffeting would cause vibration.
Ans.- aerodynamic buffeting would cause vibration.
Explanation. Rolls Royce The Jet Engine page 22 para 12 refers to too small a clearance setting up aerodynamic buffet.

Q. 82. A 1st stage LP compressor blade is able to continue in service if the damage is within limits, and within the.
A. middle third of blade chord-wise.
B. outer third only.
C. root section only.
Ans.- outer third only.
Explanation. Repairs across the chord or at the root are normally prohibited, outer third is the only safe answer.

Q. 83. What is meant by a compressor stage?.

A. One rotor and one stator assembly.
B. All rotors and stators.
C. One rotor and one guide vane assembly.
Ans.- One rotor and one stator assembly.
Explanation. Para 13 page 22 of Rolls Royce the Jet Engine refers.

Q. 84. What is the normal pressure rise across each compressor stage of an axial flow compressor?.

A. 1.5:1.
B. 1.2:1.
C. 5:1.
Ans.- 1.2:1.
Explanation. Para 20 page 25 of Rolls Royce the Jet Engine refers.

Q. 85. Where does compression take place as air passes through an axial flow compressor?.
A. Rotor blades.
B. Stator Blades.
C. Rotor and Stator blades.
Ans.- Rotor and Stator blades.
Explanation. Compression occurs through all stages figure 3.9 page 25 of Rolls Royce the Jet Engine refers.

Q. 86. Nozzle Guide Vane bow is an indication of.

A. engine overspeed.
B. engine overheat.
C. engine shock loading.
Ans.- engine overheat.
Explanation. Early turbines, both blades and NGV were susceptible to 'creep' -- prolonged exposure to excessive heat.

Q. 87. A build up of foreign objects and dirt on compressor blades.
A. has a large effect on compressor efficiency and may cause corrosion.
B. has no effect on the efficiency of the compressor but may cause corrosion.
C. has no effect on compressor efficiency due to the speed of rotation.
Ans.- has a large effect on compressor efficiency and may cause corrosion.
Explanation. Compressor washes are used to reduce this problem.

Q. 88. What is the purpose of the stator vanes in the compressor section of a gas turbine engine?.

A. Increase the velocity of the airflow.
B. Control direction of the airflow.
C. Prevent compressor surge.
Ans.- Control direction of the airflow.
Explanation. Rolls Royce The Jet Engine page 22 para 13.

Q. 89. In a twin spool compressor, the LP section runs at.
A. a lower RPM than the HP spool.
B. a higher RPM than the HP spool.
C. the same RPM than the HP spool.
Ans.- a lower RPM than the HP spool.
Explanation. NIL.

**15.5 Combustion Section.**

Q. 1. In a turbojet engine, combustion occurs at.

A. constant velocity.
B. constant volume.
C. constant pressure.
Ans.- constant pressure.
Explanation. Jepperson Gas Turbine Powerplants page 2-18 refers.

Q. 2. A tubo-annular gas turbine combustion systemconsists of.
A. a number of flame tubes in an annular air casing.
B. a number of flame tubes each with its own air casing.

C. an annular flame tube in an annular air casing.

Ans.- a number of flame tubes in an annular air casing.

Explanation. Rolls Royce book page 40 para 18.

Q. 3. In which type of turbine engine combustion chamber is the case and liner removed and installed as one unit during routine maintenance?.
A. Cannular.
B. Annular.
C. Can.
Ans.- Can.
Explanation. Jeppesen A&P Powerplant Textbook 3-23.

Q. 4. In a turboprop engine, combustion takes place at constant.
A. pressure.
B. density.
C. volume.
Ans.- pressure.
Explanation. Jeppesen A&P Powerplant Textbook 3-29.

Q. 5. The air passing through the combustion chamber is.
A. entirely combined with fuel and burned.
B. used to support combustion and to cool the engine.
C. speeded up and heated by the action of the turbines.
Ans.- used to support combustion and to cool the engine.
Explanation. NIL.

Q. 6. The air used for combustion is.
A. Primary and secondary.
B. Primary.
C. Secondary.
Ans.- Primary.
Explanation. Air through the core engine is defined as primary air.

Q. 7. Combustion chamber flame temperature is in the order of.
A. 2000°Centigrade.
B. 2000°Fahrenheit.
C. 2000°K.
Ans.- 2000°Centigrade.
Explanation. NIL.

Q. 8. Hot spots in the combustion section of a turbojet engine are possible.
A. dirty compressor blades.
B. malfunctioning fuel nozzles.
C. faulty igniter plugs.
Ans.- malfunctioning fuel nozzles.
Explanation. NIL.

Q. 9. Another name for a cannular combustion chamber is.
A. turbo-annular.
B. multiple can.
C. can-annular.
Ans.- can-annular.
Explanation. NIL.

Q. 10. Another name for a cannular combustion chamber is.
A. annular.
B. tubo-annular.
C. multiple can.
Ans.- tubo-annular.
Explanation. NIL.

Q. 11. The approximate percentage of the mass airflow taken in by the flame tube snout is.
A. 82%.
B. 8%.
C. 18%.
Ans.- 18%.
Explanation. Rolls Royce book page 36 para 6.

Q. 12. What component creates a vortex in a gas turbine flame tube?.
A. Tertiary hole.
B. Swirl vanes.
C. Cascade vanes.
Ans.- Swirl vanes.
Explanation. NIL.

Q. 13. In the combustion chamber.
A. static pressure and volume remains constant.
B. static pressure decreases slightly and volume increases.
C. static pressure and volume decreases.
Ans.- static pressure decreases slightly and volume increases.
Explanation. Jepperson Gas Turbine Powerplants Page 2-18 refers.

Q. 14. Which of the following types of combustion sections are used in aircraft turbine engines?.

A. Annular, variable, and cascade vane.
B. Multiple can, annular, and can-annular.
C. Can, multiple can, and variable.
Ans.- Multiple can, annular, and can-annular.
Explanation. NIL.

Q. 15. Secondary air in the combustion chamber is used for.
A. increasing axial velocity of gases.
B. combustion.
C. cooling.
Ans.- cooling.
Explanation. Jeppesen Gas Turbine Powerplants Page 3-31 Refers.

Q. 16. Duplex burners have.
A. two calibrated outlets.
B. variable orifices.
C. a spring.
Ans.- two calibrated outlets.
Explanation. Rolls Royce The Jet Engine Page 116 Refers.

Q. 17. The overall air/fuel ratio of a combustion chamber can vary between.
A. 45:1 and 130:1.
B. 130:1 and 200:1.
C. 10:1 and 45:1.
Ans.- 45:1 and 130:1.
Explanation. Rolls Royce The Jet Engine page 36 refers.

Q. 18. When light-up takes place.
A. the nozzle guide vanes spread the heat to adjacent flame tubes.
B. interconnectors spread the heat to adjacent flame tubes.
C. each flame tube is isolated from its neighbours.
Ans.- interconnectors spread the heat to adjacent flame tubes.
Explanation. Rolls Royce The Jet Engine page 39 refers.

Q. 19. Why do the holes in the body of the duple burner provide air to the shroud around the burner head?.
A. To assist atomisation of the fuel at slow running.
B. To reduce burner temperature.
C. To minimise carbon formation on the burner face.
Ans.- To minimise carbon formation on the burner face.

Explanation. Rolls Royce The Jet Engine figure 10.18 refers.

Q. 20. The air passing through the combustion chamber of a jet engine is.
A. entirely combined with fuel and burned.
B. used to support combustion and to cool the engine.

C. speeded up and heated by the action of the turbines.

Ans.- used to support combustion and to cool the engine.
Explanation. Rolls Royce The Jet Engine page 37 refers.

Q. 21. A toroidal vortex is.
A. a vapour trail visible in moist air conditions.
B. a region in the combustion chamber of low velocity re-circulation.
C. a bull-nosed cowling for deflecting air from the static.

Ans.- a region in the combustion chamber of low velocity re-circulation.
Explanation. Rolls Royce The Jet Engine page 36 refers.

Q. 22. Why is it necessary to have a combustion drain system?.
A. To prevent pressure build up in the combustion chamber.
B. To prevent initial over-fuelling on start up or hot start.
C. To allow water in the combustor to drain away.
Ans.- To prevent initial over-fuelling on start up or hot start.
Explanation. Excess fuel is drained on shutdown to avoid a subsequent hot start.

Q. 23. What is a cannular combustion system?.

A. One common flame tube closed in a common air casing.

B. A set of flame tubes, each mounted in a separate air casing.
C. A set of flame tubes, enclosed in a common air casing.
Ans.- A set of flame tubes, enclosed in a common air casing.
Explanation. Also known as tubo-annular see Rolls Royce The Jet Engine page 41.

Q. 24. The flame temperature is approximately.

A. 1400°Centigrade.
B. 2000°Centigrade.
C. 500°Centigrade.
Ans.- 2000°Centigrade.
Explanation. Rolls Royce The Jet Engine page 37 refers.

Q. 25. Fuel entering the combustion chamber from an atomizer spray nozzle enters as.
A. fuel in air pulses.
B. a fuel/air mixture.
C. fuel continuously.
Ans.- a fuel/air mixture.
Explanation. Rolls Royce The Jet Engine page 117 refers.

Q. 26. An advantage of an annular combustion system is.
A. unrestricted airflow at maximum RPM.
B. diameter of engine is reduced due to the cans being smaller.
C. decrease in combustor length compared to a tubo-annular combustor of the same output.
Ans.- decrease in combustor length compared to a tubo-annular combustor of the same output.
Explanation. Rolls Royce The Jet Engine Page 40 refers.

Q. 27. How is the combustion chamber drain valve closed?.
A. By 12th stage compressor air pressure.
B. By a return spring.
C. By combustion chamber gas pressure.
Ans.- By combustion chamber gas pressure.
Explanation. Jeppesen Aircraft Gas Turbine Powerplant Page 7-59 refers.

Q. 28. Which statement is true regarding the air passing through the combustion section of a jet engine?.
A. Most is used for engine cooling.
B. Most is used to support combustion.
C. A small percentage is frequently bled off at this point to be used for air-conditioning and/or other pneumatic powered systems.
Ans.- Most is used for engine cooling.
Explanation. NIL.

Q. 29. How are combustion liner walls cooled in a gas turbine engine?.
A. By secondary air flowing through the combustion chamber.
B. By bleed air vented from the engine air inlet.
C. By the pattern of holes and louvers cut in the diffuser section.
Ans.- By secondary air flowing through the combustion chamber.
Explanation. NIL.

Q. 30. Dilution air is placed.
A. in the dilution zone of the combustion chamber after the primary zone.
B. in the primary zone of the combustion chamber.
C. in the swirl vanes of the combustor.
Ans.- in the dilution zone of the combustion chamber after the primary zone.
Explanation. The air cools and adds to the mass flow.

Q. 31. A Duplex burner uses.
A. small burner at low RPM and both burner at hi RPM.

B. small burner at low RPM and large burner at hi RPM.

C. both burners at low and hi RPM.
Ans.- small burner at low RPM and both burner at hi RPM.
Explanation. Jeppesen A and P Technician Powerplant Textbook 7-66.

Q. 32. The approximate percentage of the mass airflow which bypasses the flame tube snout is.

A. 8%.
B. 82%.
C. 18%.
Ans.- 82%.

Explanation. Rolls Royce The Jet Engine page 36 shows 20%.

Q. 33. Flame stabilization in a combustion chamber is achieved by.
A. the correct burner pressure.
B. the airflow pattern.
C. the correct air/fuel ratio.
Ans.- the airflow pattern.
Explanation. Rolls Royce The Jet Engine page 36 refers.

Q. 34. Fuel nozzles are cleaned.
A. with a rag and solvent.
B. in-situ with carbon solution.
C. in-situ with detergent solution.
Ans.- in-situ with detergent solution.
Explanation. Jeppesen Aircraft Gas Turbine Powerplants page 7-54 refers.

Q. 35. When heat is added to the combustion chamber.
A. pressure increases rapidly volume remains constant.

B. pressure changes slightly and volume increases.
C. pressure rises at chamber outlet.
Ans.- pressure changes slightly and volume.
Explanation. Rolls Royce The Jet Engine page 12 figure 2-2 refers.

Q. 36. A shroud placed around fuel nozzles.

A. flakes the carbon to minimise accumulations.
B. prevents carbon build up.
C. builds up carbon deposits to assist atomisation.
Ans.- prevents carbon build up.
Explanation. Jeppesen Aircraft Gas turbine Powerplants page 7-54 refers.

Q. 37. Carbon forming on fuel spray nozzles will have the effect of.
A. increasing the combustion chamber pressure ratio.

B. producing turbulent air flow.
C. changing the fuel spray angle.
Ans.- changing the fuel spray angle.
Explanation. Carbon on the fuel nozzles will distort fuel spray flow and direction. This can cause hot spots within the combustion chamber.

Q. 38. Combustor air that is not used to support combustion.
A. will film cool the liner and dilute combustion chamber exit temperature.
B. is by-pass air.
C. is considered as the total air flow.
Ans.- will film cool the liner and dilute combustion chamber exit temperature.
Explanation. This air is known as secondary or tertiary combustor air.

Q. 39. At high rotational speed at sea level, a duple burner would be passing fuel via the.
A. main nozzle.
B. primary nozzle.
C. primary and the main nozzle.
Ans.- primary and the main nozzle.
Explanation. The duple nozzle is also called the duplex nozzle. RR the Jet Engine page 116 refers.

Q. 40. The fabricated liner of a flame tube is achieved mainly by.
A. argon arc process.
B. electric resistance welding.
C. oxyacetylene welding.
Ans.- argon arc process.
Explanation. an argon arc (T.I.G) welding is used to repair combustion liners, it is assumed that this is also the manufacturing process. can anyone confirm this with a reference.

Q. 41. Why is it necessary to have a combustion chamber drain?.
A. To allow unburnt fuel to drain away.
B. To prevent pressure build-up in the combustion chamber.
C. To allow fuel to return to LP when H.P cock is closed.

Ans.- To allow unburnt fuel to drain away.
Explanation. The residual fuel must be drained off to prevent subsequent wet starts.

Q. 42. The purpose of the swirl vanes in the combustion chamber is to produce.
A. flame re-circulation.
B. gas re-circulation.
C. adequate mixing of fuel and air.
Ans.- gas re-circulation.
Explanation. Rolls Royce The Jet Engine page 36 paragraph 7 refers to recirculating gases.

Q. 43. A vaporising burner injects fuel vapour.

A. with the airflow.
B. across the airflow.
C. against the airflow.
Ans.- against the airflow.
Explanation. Jeppesen Aircraft Gas Turbine Powerplants page 7-55 refers.

Q. 44. A duplex burner in a gas turbine engine has 2 orifices.
A. one for water injection and one for fuel flow.
B. one for low speed conditions the second used for high speed conditions.
C. one for normal flow conditions and the 2nd one to increase the normalmaximum flow.
Ans.- one for low speed conditions the second used for high speed conditions.
Explanation. This is a most right answer. Primary flow only normally occurs only during start (low flow)

Q. 45. A combustion chamber has a.
A. convergent inlet, divergent outlet.
B. convergent inlet, convergent outlet.
C. divergent inlet, convergent outlet.
Ans.- divergent inlet, convergent outlet.
Explanation. Rolls Royce - The Jet Engine (4th edition) figure 4-1, 4-3, 4-5, 4-9, pgs 36 - 42.

**15.6 Turbine Section.**

Q. 1. The three main types of turbine blades are.

A. impulse, vector, and impulse-vector.
B. reaction, converging, and diverging.
C. impulse, reaction, and impulse-reaction.
Ans.- impulse, reaction, and impulse-reaction.
Explanation. Jeppesen A&P Powerplant Textbook 3-27.

Q. 2. What are the two main basic components of the turbine section in a gas turbine engine?.
A. Stator and rotor.
B. Hot and cold.
C. Impeller and diffuser.
Ans.- Stator and rotor.
Explanation. Jeppesen A&P Powerplant Textbook 3-25.

Q. 3. Turbine impulse blading forms a.
A. constant area duct.
B. divergent duct.
C. convergent duct.
Ans.- constant area duct.
Explanation. Rolls Royce - The Jet Engine (New) Page 135 diagram.

Q. 4. The turbine section.
A. increases air velocity to create thrust.
B. uses heat energy to expand and accelerate the gas flow.
C. drives the compressor section.
Ans.- drives the compressor section.
Explanation. Jeppesen A&P Powerplant Textbook 3-25.

Q. 5. Where do stress rupture cracks usually appear on turbine blades?.
A. Across the blade root, parallel to the fir tree.
B. Across the leading or trailing edge at a right angle to the edge.
C. Along the leading edge, parallel to the edge.
Ans.- Across the leading or trailing edge at a right angle to the edge.
Explanation. Jeppesen A&P Powerplant Textbook 4-25.

Q. 6. What is meant by a shrouded turbine?.

A. The turbine blades are shaped so that their ends form a band or shroud.
B. The turbine wheel has a shroud or duct which provides cooling air to the turbine blades.
C. The turbine wheel is enclosed by a protective shroud to contain the blades in case of failure.
Ans.- The turbine blades are shaped so that their ends form a band or shroud.
Explanation. Jeppesen A&P Powerplant Textbook 3-28.

Q. 7. Turbine nozzle diaphragms located on the upstream side of each turbine wheel, are used to.

A. decrease the velocity of the heated gases flowing past this point.

B. direct the flow of gases parallel to the vertical line of the turbine blades.
C. increase the velocity of the heated gases flowing past this point.
Ans.- direct the flow of gases parallel to the vertical line of the turbine blades.
Explanation. Jeppesen A&P Powerplant Textbook 3-25.

Q. 8. Reduced blade vibration and improved airflow characteristics in turbines are brought by.
A. shrouded turbine rotor blades.
B. impulse type blades.
C. fir tree blade attachment.
Ans.- shrouded turbine rotor blades.
Explanation. NIL.

Q. 9. What term is used to describe a permanent and cumulative deformation of turbine blades?.

A. Stretch.
B. Creep.
C. Distortion.
Ans.- Creep.
Explanation. NIL.

Q. 10. What is the major function of the turbine assembly in a turbojet engine?.
A. Directs the gases in the proper direction to the tailpipe.
B. Supplies the power to turn the compressor.
C. Increases the temperature of the exhaust gases.
Ans.- Supplies the power to turn the compressor.
Explanation. NIL.

Q. 11. Gas pressure through the turbine section will generally.
A. increase.
B. remain the same.
C. decrease.
Ans.- decrease.
Explanation. NIL.

Q. 12. A condition known as 'hot streaking' in turbine engines is caused by
A. a partially clogged fuel nozzle.
B. excessive fuel flow.
C. a misaligned combustion liner.
Ans.- a partially clogged fuel nozzle.
Explanation. NIL.

Q. 13. Temperature through the turbine stages generally.
A. remains the same.
B. decreases.
C. increases.
Ans.- decreases.
Explanation. NIL.

Q. 14. Shrouded blades allow.
A. smaller inlets to be used.
B. higher turbine inlet temperatures.
C. thinner more efficient blade sections to be used.
Ans.- thinner more efficient blade sections to be used.

Explanation. Jepperson Gas Turbine Powerplants Page 3-42 refers.

Q. 15. Continued and/or excessive heat and centrifugal force on turbine engine rotor blades is likely to cause.
A. galling.
B. creep.
C. profile.
Ans.- creep.
Explanation. Jeppesen A&P Powerplant Textbook 4-22.

Q. 16. N.G.V's form.
A. convergent ducts.
B. parallel ducts.
C. divergent ducts.
Ans.- convergent ducts.
Explanation. Jepperson Gas Turbine Powerplants Page 3-38 refers.

Q. 17. Dirt particles in the air going into the compressor of a turbine engine will form a coating on all but which of the following?.
A. Turbine blades.
B. Casings.
C. Inlet guide vanes.
Ans.- Turbine blades.
Explanation. NIL.

Q. 18. Reduced blade vibration and improved airflow characteristics in gas turbines are brought about by.

A. shrouded turbine rotor blades.

B. fir tree blade attachment.
C. impulse type blades.
Ans.- shrouded turbine rotor blades.
Explanation. NIL.

Q. 19. A purpose of the shrouds on the turbine blades of an axial flow engine is to.
A. reduce air entrance.
B. increase tip speed.
C. reduce vibration.
Ans.- reduce vibration.
Explanation. NIL.

Q. 20. Hot section inspections for many modern turbine engines are required.
A. on a time or cycle basis.
B. only when an over temperature or overspeed has occurred.
C. only at engine overhaul.
Ans.- on a time or cycle basis.
Explanation. NIL.

Q. 21. Why do some turbine engines have more than one turbine wheel attached to a single shaft?.

A. To facilitate balancing of the turbine assembly.
B. To extract more power from the exhaust gases than a single wheel can absorb.
C. To help stabilize the pressure between the compressor and the turbine.
Ans.- To extract more power from the exhaust gases than a single wheel can absorb.
Explanation. NIL.

Q. 22. When aircraft turbine blades are subjected to excessive heat stress, what type of failures would you expect?.
A. Bending and torsion.
B. Stress rupture.
C. Torsion and tension.
Ans.- Stress rupture.
Explanation. NIL.

Q. 23. Which of the following conditions is usually not acceptable to any extent in turbine blades?.
A. Cracks.
B. Dents.
C. Pits.
Ans.- Cracks.
Explanation. NIL.

Q. 24. The forces driving a turbine round are due to.

A. impulse only.
B. reaction only.
C. impulse and reaction.
Ans.- impulse and reaction.
Explanation. Rolls Royce The Jet Engine Page 50 Refers.

Q. 25. Nozzle guide vanes give a.
A. pressure increase, velocity decrease.
B. pressure increase, velocity increase.
C. pressure decrease, velocity increase.
Ans.- pressure decrease, velocity increase.
Explanation. Jeppesen Gas Turbine Powerplant Page 3-35 refers.

Q. 26. Shrouding of stator blade tips is to.
A. minimise vibration.
B. ensure adequate cooling.
C. prevent tip turbulence.
Ans.- minimise vibration.
Explanation. Jeppesen Gas Turbine Powerplant Page 3-43 refers.

Q. 27. Why are two or more turbine wheels coupled?.

A. To keep turbine rotor diameter small.
B. So power output is doubled.
C. To simplify dynamic balancing.
Ans.- So power output is doubled.
Explanation. Rolls Royce The Jet Engine page 45 refers.

Q. 28. Running clearance on a turbine disk is kept to a minimum to reduce.
A. temperature loss.
B. aerodynamic buffeting.
C. tip losses.
Ans.- tip losses.
Explanation. Jeppesen Gas Turbine Powerplants Page 3-18 refers.

Q. 29. Two basic types of turbine blades are.

A. impulse and vector.
B. reaction and impulse.
C. tangential and reaction.

Ans.- reaction and impulse.
Explanation. Jeppesen Gas Turbine Powerplants Page 3-40 refers.

Q. 30. Why are nozzle guide vanes fitted?.

A. To decrease velocity of the gas flow.
B. To increase velocity of the gas flow.
C. To increase velocity of the air flow.
Ans.- To increase velocity of the gas flow.
Explanation. Jeppesen Gas Turbine Powerplants Page 3-38 refers.

Q. 31. A turbine disk is.
A. a disk at the core of the engine that the blades are attached to.
B. a segmented or complete shroud on blade tips that reduces leakage.
C. a shroud around the stators of the turbine.
Ans.- a disk at the core of the engine that the blades are attached to.
Explanation. The turbine blades are mounted to the disc which absorbs the centrifugal force.

Q. 32. .When carrying out a borescope the damage on turbine blades that would indicate a failure is.

A. speckling.
B. tip curl.
C. colour changes.
Ans.- tip curl.
Explanation. Jeppesen Gas Turbine Powerplants figure 5-23 page 178 and figure 5-26 page 185 refers.

Q. 33. The active clearance control system aids turbine engine efficiency by.
A. automatically adjusting engine speed to maintain a desired EPR.
B. adjusting stator vane position according to operating conditions and power requirements.
C. ensuring turbine blade to engine case clearances are kept to a minimum by controlling case temperatures.

Ans.- ensuring turbine blade to engine case clearances are kept to a minimum by controlling case temperatures.
Explanation. NIL.

Q. 34. Turbine rear struts.
A. straighten the gas flow.
B. increase the velocity of the gas flow.
C. increase the pressure of the gas flow.
Ans.- straighten the gas flow.
Explanation. Jeppesen Aircraft Gas Turbine Powerplant page 3-34 refers.

Q. 35. Bowing of turbine blades indicates an.

A. over-temperature condition.
B. over-speed condition.
C. under-temperature condition.
Ans.- over-temperature condition.
Explanation. Jeppesen Aircraft Gas Turbine Powerplant page 5-30 refers to bowing as part of the ageing process. Over temp is the only answer relevant to aging (temperature creep).

Q. 36. On an impulse-reaction turbine blade it is.

A. impulse at the root and reaction at the tip.
B. reaction at the root and impulse at the tip.
C. impulse and reaction all the away along the blade.
Ans.- impulse at the root and reaction at the tip.
Explanation. Jeppesen Aircraft Gas Turbine Powerplant page 3-40 refers. Rolls Royce pg.50 para.10 and figure5.6 stagger angle.

Q. 37. Turbine creep effects.
A. turbine blades.
B. turbine disks.
C. N.G.Vs.
Ans.- turbine blades.
Explanation. Jeppesen Aircraft Gas Turbine Powerplant Page 5-28 refers.

Q. 38. Creep is.
A. not found in turbines.
B. a temporary deformation of turbine.
C. a permanent deformation of turbine.
Ans.- a permanent deformation of turbine.
Explanation. Jeppesen Aircraft Gas Turbine Powerplant Page 5-28 refers.

Q. 39. Creep, overall.
A. has no effect on turbine diameter.
B. increases turbine diameter.
C. decreases turbine diameter.
Ans.- increases turbine diameter.
Explanation. Jeppesen Aircraft Gas Turbine Powerplant Page 5-28 refers.

Q. 40. How are turbine disks attached to the shaft in gas turbine engine?.
A. Splined.
B. Curvic couplings.
C. Bolted.
Ans.- Bolted.
Explanation. Jeppesen Aircraft gas Turbine Powerplant page 3-41 refers.

Q. 41. Fir tree turbine blade attachment locates the blade.
A. allows slight movement.
B. radially.
C. axially.
Ans.- allows slight movement.
Explanation. Rolls Royce The Jet Engine page 52 Para 19 refers.

Q. 42. Creep may occur to turbine blades due to.

A. prolonged low RPM use.
B. over-temp with excessive centrifugal loads.
C. high back pressures.
Ans.- over-temp with excessive centrifugal loads.
Explanation. Creep is irreversible Rolls Royce the Jet Engine Page 56 refers.

Q. 43. Creep may occur to turbine blades due to.

A. prolonged low RPM use.
B. over-temp with excessive centrifugal loads.
C. high back pressures.
Ans.- over-temp with excessive centrifugal loads.
Explanation. Creep is irreversible Rolls Royce the Jet Engine Page 56 refers.

Q. 44. Forces driving the turbine are due to.

A. aerodynamic lift imposing impulse on blades.
B. momentum and directional acceleration of gases.
C. expansion of gases.
Ans.- momentum and directional acceleration of gases.

Explanation. Rolls Royce The Jet Engine Page 49-50 refers.

Q. 45. Impulse turbine blades run cooler than reaction blades because.
A. impulse spin faster radially.
B. temperature drop across N.G.V is greater.
C. converging rotors increase velocity.
Ans.- temperature drop across N.G.V is greater.
Explanation. Impulse blades have total pressure drop in N.G.V's hence air is colder as it enters turbine RR Page51 refers.

Q. 46. An increase in turbine diameter is caused by.

A. prolonged high temperatures and centrifugal loads.

B. products of combustion.
C. over speed.
Ans.- prolonged high temperatures and centrifugal loads.
Explanation. This is known as creep.

Q. 47. Which of the following is most likely to occur in the turbine section of a gas turbine engine?.
A. Pitting.
B. Galling.
C. Cracking.
Ans.- Cracking.
Explanation. A turbine bearing is under great heat stress, cracking is the only possible choice here.

Q. 48. Aluminium deposits on the turbine show up as.

A. white or silver speckles.
B. white powder traces.
C. black stains.
Ans.- white or silver speckles.
Explanation. CAIPs E L/3-10 refers. It also says titanium speckles are blue or gold.

Q. 49. An impulse/reaction turbine is designed to ensure.
A. greater axial velocity at the blade root.
B. uniform axial velocity from blade root to tip.
C. greater axial velocity at the blade tip.
Ans.- uniform axial velocity from blade root to tip.
Explanation. Jeppesen Gas turbine Powerplant page 3-40 refers.

Q. 50. Excessive turbine temperatures can lead to.

A. turbine blade creep and an increase in the diameter of the turbine.
B. not a serious problem as long as engine oil pressure is within limits.
C. a serious fire risk in the engine.
Ans.- turbine blade creep and an increase in the diameter of the turbine.
Explanation. Jeppesen gas turbine Powerplant Page 5-28 discusses the causes of creep.

Q. 51. What are blue and golden deposits evidence of, on a turbine blade?.
A. Titanium.
B. Aluminium.
C. Magnesium.
Ans.- Titanium.
Explanation. Aluminium and magnesium leave white powder deposits so by elimination the answer is titanium.

Q. 52. Necking and mottling of turbine blades.

A. is due to thermal stress.
B. is formed during manufacture.
C. is due to bending when the gas hits the blades.
Ans.- is due to thermal stress.
Explanation. Necking could occur due to creep which is a function of thermal stress and centrifugal loads, and turbine blades do show signs of discolouration after use, the latter is not normally a defect.

Q. 53. Impulse blades operate cooler than reaction blades because.
A. impulse blades rotate at higher speeds.
B. the N.G.V's cool the air.
C. the airflow has a higher velocity through a impulse turbine N.G.V.
Ans.- the airflow has a higher velocity through a impulse turbine N.G.V.
Explanation. Impulse turbine N.G.Vs accelerate gases faster than their reaction counterparts therefore the pressure and temperature is reduced more in the impulse turbine.

Q. 54. During a borescope check of the H.P turbine blades.
A. dry motor the engine at minimum speed.
B. hand turn the turbine wheel.
C. attach a device to the accessory gearbox and rotate slowly.
Ans.- attach a device to the accessory gearbox and rotate slowly.
Explanation. All large GTE have a hand turning tool adaptor fitted to the accessory or high speed gearbox.

Q. 55. The turbine section of a jet engine.
A. converts dynamic pressure into mechanical energy.

B. circulates air to cool the engine.
C. extracts heat energy to drive the compressor.
Ans.- converts dynamic pressure into mechanical energy.
Explanation. The shape and size of the turbine blades determines the amount of energy extracted from the dynamic pressure of the airflow.

Q. 56. The temperature and centrifugal loads which the turbine is subjected to during normal engine operation causes.
A. fatigue failure.
B. elastic stretching.
C. creep loading.
Ans.- creep loading.
Explanation. Creep is a permanent deformation caused by high centrifugal loads at continuous high temperature.

Q. 57. Impulse-reaction turbine blades form.

A. tip half reaction, root half Impulse.
B. 1 stage impulse, 1 stage reaction.
C. tip half Impulse, root half reaction.
Ans.- tip half reaction, root half Impulse.
Explanation. Turbine blades move from impulse at the root to reaction at the tip.

Q. 58. A fir tree root.
A. allows compressor cooling air to alleviate thermal stress.
B. attaches turbine blades to the turbine disk.
C. allows individual turbine blades to be changed without engine disassembly.
Ans.- attaches turbine blades to the turbine disk.
Explanation. Rolls Royce the Jet Engine Page 52 para 19 refers.

Q. 59. The passage between adjacent nozzle guide vanes forms a.
A. convergent duct.
B. divergent duct.

C. parallel duct.
Ans.- convergent duct.
Explanation. Rolls Royce The Jet Engine page 51 paragraph 13 refers.

Q. 60. As the hot gasses flow through an impulse turbine blading, the velocity.
A. will decrease.
B. remains constant.
C. will increase.
Ans.- remains constant.
Explanation. In an 'Impulse bladed turbine' the turbine blades form parallel ducts therefore the velocity will remain constant figure 5-5 of RR the Jet Engine shows the contour of impulse turbine blades.

Q. 61. What is the normal range of turbine efficiency?.
A. 90% - 95%.
B. 70% - 85%.
C. 30% - 40%.
Ans.- 90% - 95%.
Explanation. Rolls Royce The Jet Engine page 51 Para 11 refers to 92%.

Q. 62. Turbine engine components are never manufactured by.
A. electrical resistance welding.
B. argon arc welding.
C. gas welding.
Ans.- gas welding.
Explanation. Both Argon arc and Electron beam welding are referred to in RR the Jet Engine so we assume gas welding is not used, this is probably due to carburisation of the weld.

Q. 63. How is a radial turbine driven?.
A. By impulse.
B. By change of momentum and angle of airflow.
C. By reaction.
Ans.- By change of momentum and angle of airflow.
Explanation. Radial turbines are effectively reversed centrifugal compressors.

Q. 64. Turbine disk growth is due to.
A. a permanent change in disk diameter.
B. an overall increase in blade length.
C. a build up of carbon deposits.
Ans.- a permanent change in disk diameter.
Explanation. The turbine disc does not include the blades.

Q. 65. A nozzle guide vane is.
A. hollow in construction to allow for thermal expansion.
B. hollow in construction to allow for flow of cooling air.
C. solid in construction to support the guide vane.
Ans.- hollow in construction to allow for flow of cooling air.
Explanation. Air is tapped from the H.P compressor and passed through the N.G.V to cool it.

Q. 66. A slow constant growth in a turbine blade is known as.
A. primary creep.
B. secondary creep.
C. tertiary creep.
Ans.- secondary creep.
Explanation. NIL.

**15.7 Engine Exhaust.**

Q. 1. The function of the exhaust cone assembly of a turbine engine is to.
A. swirl and collect the exhaust gases into a single exhaust jet.
B. collect the exhaust gases and act as a noise suppressor.
C. straighten and collect the exhaust gases into a solid exhaust jet.
Ans.- straighten and collect the exhaust gases into a solid exhaust jet.
Explanation. Jeppesen A&P Powerplant Textbook 3-20.

Q. 2. A nozzle is 'choked' when the gas flow or air flow at the throat is.
A. sonic.
B. subsonic.
C. supersonic.
Ans.- sonic.
Explanation. Rolls Royce The Jet Engine page 14; refers.

Q. 3. The struts on the exhaust cone.
A. straighten the gas flow only.

B. support the exhaust cone and straighten the gas flow.

C. support the exhaust cone only.
Ans.- support the exhaust cone and straighten the gas flow.
Explanation. NIL.

Q. 4. A nozzle is 'choked' when the engine inlet airflow is.
A. subsonic.
B. supersonic.
C. subsonic or supersonic.
Ans.- subsonic or supersonic.
Explanation. NIL.

Q. 5. What is the maximum practical angle through which the gas flow can be turned during thrust reversal?.
A. 180°.
B. 50°.
C. 135°.
Ans.- 135°.
Explanation. Rolls Royce The Jet Engine page 160 refers.

Q. 6. A supersonic duct is.
A. convergent then divergent along its length.
B. divergent then convergent along its length.
C. a convergent duct that is choked at the largest end at mach 1.
Ans.- convergent then divergent along its length.
Explanation. Visualise the exhaust nozzle of the space shuttle booster rockets.

Q. 7. Noise from the jet wake when untreated by suppression is.
A. high frequency, high decibel.
B. low frequency, low decibel.
C. low frequency, high decibel.
Ans.- low frequency, high decibel.
Explanation. Jepperson Gas Turbine Powerplants Page 3-57 refers.

Q. 8. Hot spots on the tail cone of a turbine engine are possible indicators of a malfunctioning fuel nozzle or.
A. a faulty igniter plug.
B. an improperly positioned tail cone.
C. a faulty combustion chamber.
Ans.- a faulty combustion chamber.
Explanation. NIL.

Q. 9. An exhaust cone placed aft of the turbine in a jet engine will cause the pressure in the first part of the exhaust duct to.
A. increase and the velocity to decrease.
B. decrease and the velocity to increase.
C. increase and the velocity to increase.
Ans.- increase and the velocity to decrease.
Explanation. Jeppesen A&P Powerplant Textbook 3-30.

Q. 10. A convergent-divergent nozzle.
A. requires the aircraft to be travelling at supersonic speeds.
B. makes maximum use of pressure thrust.
C. produces a type of thrust known as kinetic thrust.
Ans.- makes maximum use of pressure thrust.
Explanation. NIL.

Q. 11. The velocity of supersonic air as it flows through a divergent nozzle.
A. decreases.
B. increases.
C. is inversely proportional to the temperature.
Ans.- increases.
Explanation. NIL.

Q. 12. The Jet Pipe of a gas turbine engine.

A. protects the airframe from heat damage.
B. has an inner cone to protect the rear turbine disc.
C. is convergent in shape to increase the velocity as much as possible.
Ans.- protects the airframe from heat damage.
Explanation. NIL.

Q. 13. For what purpose is the propelling nozzle of a gas turbine engine designed?.
A. To increase the velocity and decrease the pressure of the gas stream leaving the nozzle.
B. To decrease the velocity and increase the pressure of the gas stream leaving the nozzle.
C. To increase the velocity and pressure of the gas stream leaving the nozzle.
Ans.- To increase the velocity and decrease the pressure of the gas stream leaving the nozzle.
Explanation. NIL.

Q. 14. If the exit area of the nozzle was too large, the effect is.
A. exit velocity lower causing loss of thrust.
B. will choke at a lower gas temperature.
C. exit velocity lower, negligible effect on thrust.
Ans.- exit velocity lower causing loss of thrust.
Explanation. NIL.

Q. 15. A choked nozzle.
A. increases thrust.
B. decreases thrust.
C. has no effect on the thrust.
Ans.- increases thrust.
Explanation. NIL.

Q. 16. The exhaust section is designed to.
A. increase temperature, therefore increasing velocity.

B. decrease temperature, therefore decreasing pressure.
C. impart a high exit velocity to the exhaust gases.
Ans.- impart a high exit velocity to the exhaust gases.
Explanation. NIL.

Q. 17. Reverse thrust can only be selected when the throttle is.
A. closed.
B. 75% power position.
C. open.
Ans.- closed.
Explanation. Rolls Royce The Jet Engine page 160 refers.

Q. 18. A Convergent-Divergent nozzle.
A. makes maximum use of Pressure thrust.
B. produces a type of thrust known as kinetic thrust.
C. requires the aircraft to be travelling at supersonic speeds.
Ans.- makes maximum use of Pressure thrust.
Explanation. Jeppesen Gas Turbine Powerplants Page 3-49 refers.

Q. 19. On front fan engines, to obtain thrust reversal, the.
A. hot and cold streams are reversed.
B. hot stream is reversed.
C. cold stream is reversed.
Ans.- cold stream is reversed.
Explanation. Rolls Royce The Jet Engine page 159 refers.

Q. 20. Exhaust noise can be reduced by.
A. lowering the vibration frequency.
B. increasing the mixing rate.
C. increasing the jet velocity.
Ans.- increasing the mixing rate.
Explanation. Rolls Royce The Jet Engine page 201 refers.

Q. 21. Operating thrust reversers at low ground speeds can sometimes cause.
A. sand or other foreign object ingestion, hot gas re-ingestion.
B. hot gas re-ingestion, compressor stalls.
C. sand or other foreign object ingestion, hot gas re-ingestion, compressor stalls.
Ans.- sand or other foreign object ingestion, hot gas re-ingestion, compressor stalls.
Explanation. Jeppesen A&P Technician Propulsion Textbook 6-10.

Q. 22. Thrust reversers utilizing a pneumatic actuating system, usually receive operating pressure from.

A. the engine bleed air system.
B. high pressure air reservoirs.
C. an on-board hydraulic or electrical powered compressor.
Ans.- sand or other foreign object ingestion, hot gas re-ingestion, compressor stalls.
Explanation. NIL.

Q. 23. The purpose of cascade vanes in a thrust reversing system is to.
A. turn the exhaust gases forward just after exiting the exhaust nozzle.
B. form a solid blocking door in the jet exhaust path.
C. turn to a forward direction the fan and/or hot exhaust gases that have been blocked from exiting through the exhaust nozzle.
Ans.- turn to a forward direction the fan and/or hot exhaust gases that have been blocked from exiting through the exhaust nozzle.
Explanation. NIL.

Q. 24. A convergent exhaust nozzle produces mainly.

A. momentum and pressure thrust.
B. momentum thrust.
C. pressure thrust.

Ans.- momentum thrust.
Explanation. Rolls Royce The Jet Engine Page 218.

Q. 25. The rearward thrust capability of an engine with the thrust reverser system deployed is.
A. equal to or less than its forward capability, depending on ambient conditions and system design.
B. less than its forward capability.
C. equal to its forward capability.
Ans.- less than its forward capability.
Explanation. Jeppesen A&P Technician Propulsion Textbook 6-10.

Q. 26. Which statement is generally true regarding thrust reverser systems?.
A. Engine thrust reversers on the same aircraft usually will not operate independently of each other (must all be simultaneously).
B. It is possible to move some aircraft backward on the ground using reverse thrust.
C. Mechanical blockage system design permits a deployment position aft of the exhaust nozzle only.
Ans.- It is possible to move some aircraft backward on the ground using reverse thrust.
Explanation. Jeppesen A&P Technician Propulsion Textbook 6-9.

Q. 27. What is the proper operating sequence when using thrust reversers to slow an aircraft after landing?.

A. Advance thrust levers up to takeoff position as conditions require, select thrust reverse, de-select thrust reverser, retard thrust levers to ground idle.
B. Retard thrust levers to ground idle, raise thrust reverser levers as required, and retard thrust reverser levers to ground idle.
C. Select thrust reverse, advance thrust reverser levers no higher than 75% N1, and retard thrust reverser levers to idle at approximately normal taxi speed.
Ans.- Retard thrust levers to ground idle, raise thrust reverser levers as required, and retard thrust reverser levers to ground idle.
Explanation. Jeppesen A&P Technician Propulsion Textbook 6-9.

Q. 28. Most exhaust system failures result from thermal fatigue cracking in the areas of stress concentration. This condition is usually caused by.

A. the high temperatures at which the exhaust system operates.
B. improper welding techniques during manufacture.
C. the drastic temperature change which is encountered at altitude.
Ans.- the high temperatures at which the exhaust system operates.
Explanation. NIL.

Q. 29. Thrust reversal on a high bypass engine is achieved by.
A. blocker doors.
B. clamshell configuration.
C. bucket type doors.
Ans.- blocker doors.
Explanation. RR Page 160 figure.15-2 refers but see also Jeppesen Aircraft Gas Turbine Powerplant Page 3-50.

Q. 30. If damage is found to the reverse thrust cascade vanes and they need replacing, you can.

A. replace damaged vanes with 45 degree vanes.
B. only replace vanes with new ones that have the correct part as the originals removed.
C. interchange the cascade vanes as they are interchangeable.
Ans.- only replace vanes with new ones that have the correct part as the originals removed.
Explanation. Cascade vane segments are NOT interchangeable, they all direct air at different angles.

Q. 31. When should thrust reversers be used?.

A. At low RPM and low forward speed.
B. At high RPM and high forward speed.
C. At high RPM and low forward speed.
Ans.- At low RPM and low forward speed.
Explanation. Thrust reversers cannot be actuated if the throttles are set above idle and they can only be used on the ground.

Q. 32. If the area of the nozzle was too large the effect is.
A. will 'choke' at mach 1.
B. exit velocity lower causing loss of the thrust.
C. exit velocity lower, negligible effect on thrust.
Ans.- exit velocity lower causing loss of the thrust.
Explanation. Jeppesen Aircraft Gas Turbine Powerplant page 2-20 and others.

Q. 33. Lobe type exhaust noise suppressors are made from.
A. heat resistant alloy.
B. composite Material.
C. steel.
Ans.- heat resistant alloy.
Explanation. Rolls Royce The Jet Engine Page 205 refers.

Q. 34. What indication does the pilot receive that thrust reversers have deployed?.
A. An audible warning.
B. A sequence of lights.
C. A feeling of rapid deceleration.
Ans.- A sequence of lights.
Explanation. Boeing 757/767 use the word 'rev' in amber for unlocked and green for deployed on the upper EICAS screen.

Q. 35. What angle are the exhaust gasses turned through in a clamshell type thrust reverser?.

A. 180 degrees.
B. 135 degrees.
C. 45 degrees.
Ans.- 135 degrees.
Explanation. Turned through 135 degrees is 45 degrees forward, the maximum a thrust reverser of any sort turns the air forward.

Q. 36. The purpose of a propelling nozzle is to.

A. increase the velocity of the air and increase thrust.

B. decrease the velocity of the exhaust to increase static pressure.
C. direct the air onto the turbines.
Ans.- increase the velocity of the air and increase thrust.

Explanation. The convergence of the propelling nozzle in a subsonic pure jet engine is set so that max speed is just below Mach 1.

Q. 37. If a thrust reverser is deployed at lower than normal landing speed.
A. exhaust gases can be ingested into the engine.
B. the thrust reverser will be ineffective.
C. if the EGT gets too high the thrust reverser will automatically restow.
Ans.- exhaust gases can be ingested into the engine.
Explanation. Exhaust gas ingestion is a problem for thrust reverser systems when stationary or very slow.

Q. 38. The size of the exhaust section is dictated by.

A. cone or diffuser size and location.
B. size of engine only.
C. size and location of the engine.
Ans.- size and location of the engine.
Explanation. The exhaust section is of a certain diameter and can be of different lengths depending on the location of the engine within the fuselage or wing root (IE English Electric Lightning).

Q. 39. On a Clamshell door type thrust reverser. The Clamshell doors redirect the exhaust gas stream.

A. 0 degrees to the thrust line.
B. 45 degrees to the thrust line.
C. 90 degrees to the thrust line.
Ans.- 45 degrees to the thrust line.
Explanation. 45 degrees to the thrust line is an alternative to 'turned through 135 degrees'.

Q. 40. Normal gas turbine engine's exhaust duct is.

A. divergent.
B. convergent/divergent.
C. convergent.
Ans.- convergent.
Explanation. The exhaust nozzle consists of a parallel duct then the propelling nozzle which is always convergent.

Q. 41. As the air flows out at the outflow of a choked nozzle.
A. velocity increases and pressure decreases.
B. velocity and pressure decrease.
C. velocity decreases and pressure increases.
Ans.- velocity decreases and pressure increases.
Explanation. A choked nozzle has a shock wave in it and air is at Mach 1. After the shock the air must be decreased in speed and pressure is rising.