



# **SSC JE 2019 Tier-1 MECHANICAL ENGINEERING**

27th Oct. Shift-1

**Memory Based Questions with Solutions** 





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### SSC JE 2019 Mechanical Engineering Detailed Weightage Analysis

Shift-1					
Subject	Difficulty Level	No. of Questions			
Theory of Machines	-	ZERO			
Machine Design	Easy	4-5			
Engineering Mechanics	Easy	4 -5			
Strength of Materials	Easy	1 to 2			
Thermal Engineering	Moderate	55-60			
Fluid Mechanics & Machinery	Easy	15-20			
Production Engineering	Easy	7-9			
Reasoning	Tough	50			
General Awareness	Moderate	50			
OVERALL	Easy	200 Qs			

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#### MECHANICAL ENGINEERING

### **Memory Based Questions Shift-I**

- 1. When a fluid is at rest Shear stress will be?
- According to the newton's law of viscosity the velocity gradient for static fluid is zero thus shear Sol. stress will be zero.
- 2. What is the maximum operating pressure of Lancashire boilers?
- Sol. The maximum operating pressure range of Lancashire Boiler is 16-20bar.
- 3. What is the number of Chlorine atoms in R-134a?
- Sol. Chemical formula of R-134a is C2H2F4 that means it has zero Chlorine atoms.
- 4. What is the range of the Efficiency of Cochran boiler?
- Sol. The range of the Efficiency of Cochran boiler is 70 to 75%
- 5. What is the Refrigerant used in a domestic refrigerator?
- Sol. Refrigerant R-134A is the used in domestic refrigerator.
- 6. For a good steam power plant Efficiency will be?
- Sol. For a good steam power plant Efficiency will be 35 to 45%
- 7. What is the value of gamma for monoatomic gases?
- Sol. The value of gamma for monoatomic gases is 1.67
- 8. What is the value of gamma for triatomic gases?
- Sol. The value of gamma for triatomic gases is 1.33
- 9. What is the composition in HS 6-5-2-5?
- Sol. high speed steel
- 10. What is the dryness fraction if 1.5 kg water and 50kg steam is present?
- Sol. Dryness fraction = 50/(50+1.5)=0.97
- 11. Instrument used to find small variations in pressure?
- Sol. Instrument used to find small variations in pressure is single column manometer which is a piezometer.
  - A piezometer is either a device used to measure liquid pressure in a system by measuring the height to which a column of the liquid rises against gravity, or a device which measures the pressure of groundwater at a specific point.
- 12. Which one of the following is a water tube boiler? (Find it out among the options)
- Sol. In Water tube boilers, water flows inside the tubes (water tube) while flames and hot gasses surround outside the tubes. Example: Stirling Boiler, La-Mont Boiler, Benson Boiler, Yarrow Boiler, Babcock and Wilcox Boilers are the examples of Water tube boilers.
- 13. What is the Efficiency of a Fire tube boiler?
- The Efficiency of a Fire tube boiler is 75% while water tube boiler is 90% Sol.
- 14. What is the Pressure range of fire tube boilers?
- Sol. The pressure range of the fire tube boiler is 7 bar to 20bar.



- 15. What is the shape of differential manometer?
- Sol. The shape of differential manometer is U tube.
- 16. What is the formula of Clearance ratio?
- Sol. Clearance ratio is the ratio of Clearance volume(Vc) to the swept volume(Vs).
- 17. What is the degree of freedom of structure?
- Sol. In physics, the degrees of freedom (DOF) of a mechanical system is the number of independent parameters that define its configuration or state. And structure is having DOF = 0
- 18. What is the degree of freedom of superstructure?
- Sol. A superstructure is an upward extension of an existing structure above a baseline. This term is applied to various kinds of physical structures such as buildings, bridges, or ships having the degree of freedom negative(-ve).
- 19. What is the Carnot efficiency if  $T_1 = 1990$  K and  $T_2 = 850$  K?

Sol. 
$$\eta = 1 - \frac{T_L}{T_H} = 1 - \frac{850}{1990} = 57.28\%$$

- 20. What is the range of specific speed of Kaplan Turbine?
- Sol. The specific speed value for a turbine is the speed of a geometrically similar turbine which would produce unit power (one kilowatt) under unit head (one meter). The specific speed of a turbine is given by the manufacturer (along with other ratings) and will always refer to the point of maximum efficiency. This allows accurate calculations to be made of the turbine's performance for a range of heads.

$$n_s = n\sqrt{P} / H^{5/4}$$

A kaplan turbine has a specific speed in the range of 300 to 1000.

- 21. What is the difference between Brake Power and Indicated Power?
- The difference between brake power and indicated power is friction power. It is power lost in Sol. overcoming friction in the engine.

Brake power is defined as the power developed by an engine at the output shaft while indicated power is defined as the total power developed by combustion of fuel in the combustion chamber

- 22. What is the Efficiency of the Rankine cycle?
- Net work / Head supplied (generally varies from 35-45%) Sol.
- 23. Enthalpy Formula in terms of internal energy pressure and volume?
- Sol. Enthalpy is the total heat content of the system is equal to (U+PV). U-internal energy

PV- flow work which is the work required for continuous mass flow in an open system.

- What is the Isentropic efficiency formula? 24.
- Sol. Isentropic efficiency is generally used when we have mechanical irreversibilities in compressors, pumps and turbines.

Isentropic efficiency of turbine= Actual work/Isentropic work

Isentropic efficiency of compressor= Isentropic work/actual work

- 25. What is the formula of Coefficient of discharge in terms of Coefficient of Velocity and Coefficient of vena contracta?
- Sol. Coefficient of discharge is equal to product of Coefficient of Velocity and Coefficient of vena contracta, Cd=Cv\*Cc



- 26. In steam nozzles, the enthalpy is converted to?
- Sol. In a steam nozzle, the enthalpy gets converted into kinetic energy. Whereas in a diffuser, kinetic energy gets converted into pressure energy or enthalpy.
- 27. Varignon Theorem statement
- Sol. The theorem states that the torque of a resultant of two concurrent forces about any point is equal to the algebraic sum of the torques of its components about the same point.
- 28. What is the highest value of Poisson's ratio?
- Sol. 0.5 for rubber plastic clay and paraffin
- 29. What is the formula of work done in terms of enthalpy?
- Work done is equal to change in enthalpy at inlet and exit. Sol.
- 30. If two force acting at a point, then for equilibrium, the force should be
- Ans. collinear, equal and unlike
- 31. Types of fluid when shear stress is directly proportional to shear strain?
- Sol. Such a type of fluid is called Newtonian fluid.
- 32. Range in percentage of clearance volume for reciprocating compressor?
- Sol. It ranges from 5% to 7%.
- 33. Clearance Ratio Formula
- Sol. question is same as question 16.
- 34. Bearing used in high speed engines.
- Sol. Ball Bearings are used in high speed engines.
- 35. Formula for mechanical efficiency
- Sol. mechanical efficiency is equal to ratio of Brake power/indicated power
- 36. Vacuum pressure in terms of atmospheric pressure and gauge pressure
- Sol. Patm - Pgauge = Pvaccum
- 37. At Zero pressure which is correct
- Ans. absolute pressure and molecular momentum transfer is zero
- 38. Entropy is the ratio of
- Sol. Heat to absolute temperature
- 39. R717 is the formula
- Sol. NH3
- 40. Otto cycle consists of which process?
- Sol. Two isochoric process and two reversible adiabatic or isentropic process
- 41. A fluid is made to rotate with the use of some external torque then motion is
- Sol. Forced Vortex motion
- 42. Nozzle efficiency formula in terms of enthalpy drop
- Sol. Useful enthalpy drop \ actual enthalpy drop
- 43. Circle which is used to find tangential and normal stress in a oblique plane
- Sol. mohr circle
- 44. Formula of friction factor for laminar flow in terms of reynolds number
- Sol. 64/Re
- 45. If shear stress is proportional to velocity gradient, then which kind of fluid it is?
- Sol. Newtonian fluid



- 46. Transmission dynamometer is used to measure
- Sol. **Brake Power**
- 47. Ideal Plastic Fluid
- Sol. bingham fluid
- 48. Stability of floating body depends upon
- Sol. Metacenter
- 49. If viscous flow is taking place in a circular pipe, then Reynolds number should be?
- Sol. Re < 2000
- 50. For flow to be laminar..reynolds number should be
- Sol. Re < 2000
- 51. What is the value of the friction factor for laminar flow through a pipe?
- Friction factor for laminar flow through pipe is given by f' = 64/ReSol. Whereas friction coefficient is given by f = 16/Re
- 52. What is the opposite of a centrifugal pump?
- Sol. Hydraulic Turbine
- 53. What is the clearance given in a reciprocating pump?
- Sol. approx 3%
- 54. What is the reciprocal of specific volume?
- Sol. Mass density
- 55. Which of the following becomes a secondary refrigerant when temperature is above zero Celsius?
  - A. water
  - B. Brine
  - C. Sodium Chloride
  - D. Ammonia
- Secondary refrigerants are those liquids, which are used for transporting thermal energy from Sol. one location to other. Secondary refrigerants are also known under the name brines or antifreezes. Of course, if the operating temperatures are above 0o C, then pure water can also be used as secondary refrigerant, for example in large air conditioning systems. Antifreezes or brines are used when refrigeration is required at sub-zero temperatures.
- 56. In a refrigerator with 10 ton refrigeration, how much heat would be exchanged in an hour?
- $3.5 \times 10 \times 3600 = 126000 \text{ KJ}$ Sol.
- 57. According to standards, how many safety valves should be there in a boiler?
- Sol.
- 58. Types of fluid when shear stress is directly proportional to shear strain and it shear stress has some minimum value?
- Sol. bingham plastic
- Vorticity is how many times of angular Velocity 59.
- Sol. 2 times ( $\Omega = 2\omega$ )
- 61. Jet ratio of a francis turbine is given by
- Sol. Jet ratio = Jet diameter/ Pitch circle diameter of wheel



- 62. If at the inlet of any turbine, the energy is only in the form of Kinetic energy then the type of turbine is
- Sol. Impulse Turbine
- 63. Instrument which is used to measure the flow rate?
- Sol. Venturimeter, Orificemeter, Rotameter and Pitot Tube are used to measure flow rate.
- 64. Bootstrap air cooling system contains how many heat exchangers?
- It contains two heat exchangers. (air cooler and after cooler) Sol.
- 65. Morse Test is used to find which power?
- Sol. Morse Test is used to measure the approximate Indicated Power of a Multi-cylinder Engine.
- 66. Process of formation of bubble due to low pressure and its bursting is known as
- Sol. Cavitation
- 67. Due to sudden closing of valve, a back pressure wave is generated, this phenomenon is known
- Sol. Water Hammer
- 68. Iron carbide name
- Sol. Cementite
- 69. When martensite is cooled and kept at some temperature above atmospheric temperature then
- Sol. Bainite
- 70. When the velocity of fluid is not changing with respect to the time then the flow is known as
- Sol. Steady Flow
- 71. Composition of high speed steel
- Sol. Chromium 4% Vanadium 2%, molybdenum 10%, tungsten 6%, cobalt 9%
- 72. Which of the following is a water tube boiler
- Sol. Velox Boiler is a forced circulation water tube boiler.
- 73. Which of the following is the assumption used in Air standard cycle?
- Sol. All the process are reversible

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### SSC JE 2019 Mechanical Engineering Expected Cutoff

Expected Cutoff						
Years	General	EWS	ОВС	SC	ST	
2018	152.16	147.47	149.30	133.39	125.49	
2019	152-157	142-144	152	125	122	



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