**Sample Question Bank**

**Program: Mechanical Engineering**

**Curriculum Scheme: Rev2019**

**Third Year, Semester VI**

**Course Code: MEC-602 and Course Name: Turbo Machinery**

**Multiple Choice Questions : Sample Question Set**

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| 1. | The ratio of work-done per cycle to the stroke volume of the compressor is known as \_\_\_\_\_\_\_. |
| Option A: | Compressor capacity |
| Option B: | Compression ratio |
| Option C: | Compressor efficiency |
| Option D: | Mean effective pressure |
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| 2. | Volumetric efficiency is \_\_\_\_\_\_\_\_\_. |
| Option A: | The ratio of stroke volume to clearance volume |
| Option B: | The ratio of the air actually delivered to the amount of piston displacement |
| Option C: | Reciprocal of compression ratio |
| Option D: | Index of compressor performance |
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| 3. | Intercooling in compressors......... |
| Option A: | Cool the delivered air |
| Option B: | Results in saving of power in compressing a given volume to given pressure |
| Option C: | Is the standard practice for big compressors |
| Option D: | Enable compression in two stages |
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| 4. | The first stage of compression is done in \_\_\_\_ cylinder and next stage in \_\_\_\_ cylinder. |
| Option A: | both in high pressure cylinder |
| Option B: | both in low pressure cylinder |
| Option C: | high pressure, low pressure |
| Option D: | low pressure, high pressure |
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| 5. | In an impulse turbine \_\_\_\_ |
| Option A: | The steam is expanded in nozzles only and there is a pressure drop and heat drop |
| Option B: | The steam is expanded both in fixed and moving blades continuously |
| Option C: | The steam is expanded in moving blades only |
| Option D: | The pressure and temperature of steam remains constant |
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| 6. | The degree of reaction is defined as the ratio........ |
| Option A: | Heat drop in the fixed blades to the heat drop in the moving blades. |
| Option B: | Heat drop in the moving blades to the heat drop in the fixed blades. |
| Option C: | Heat drop in the fixed blades to the total heat drop in the moving blades. |
| Option D: | Heat drop in the moving blades to the total heat drop in the fixed blade. |
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| 7. | The ratio of workdone on the blades per kg of steam to the energy supplied to the blades is called \_\_\_\_\_\_\_\_\_\_\_ |
| Option A: | Gross or stage efficiency |
| Option B: | Diagram or blading efficiency |
| Option C: | Nozzle efficiency |
| Option D: | Mechanical efficiency |
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| 8. | In a reaction turbine \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. |
| Option A: | The steam is allowed to expand in the nozzle,where it gives a high velocity before it enters the moving blades |
| Option B: | The expansion of steam takes place partly in the fixed blades and partly in the moving blades |
| Option C: | The steam is expanded from a high pressure to a condenser pressure in one or more nozzles |
| Option D: | The pressure and temperature of steam remains constant |
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| 9. | The blade speed ratio of impulse turbine is given as \_\_\_\_\_\_\_\_\_\_\_ |
| Option A: | (Blade velocity) / (Steam velocity at inlet) |
| Option B: | (Blade velocity) / (Steam velocity at exit) |
| Option C: | (Steam velocity at inlet) / (Blade velocity) |
| Option D: | (Steam velocity at exit) / (Blade velocity) |
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| 10. | The blades of the gas turbine rotor are made of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. |
| Option A: | Stainless steel |
| Option B: | High alloy steel |
| Option C: | High nickel alloy |
| Option D: | Carbon steel |
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| **11.** | In a two stage gas turbine plant, with intercooling and reheating\_\_\_\_\_\_\_\_\_\_. |
| Option A: | Both work ratio and thermal efficiency improve |
| Option B: | Work ratio improves but thermal efficiency decreases |
| Option C: | Thermal efficiency improves but work ratio decreases |
| Option D: | Both work ratio and thermal efficiency decreases |
|  |  |
| **12.** | The ratio of heat actually released by 1kg of fuel to heat that would be released by complete perfect combustion, is called\_\_\_\_\_\_\_\_\_\_\_ |
| Option A: | 1. Thermal efficiency |
| Option B: | 1. Combustion efficiency |
| Option C: | 1. Engine efficiency |
| Option D: | 1. Compression efficiency |
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| **13.** | Which energy generated in a turbine is used to run electric power generator linked to the turbine shaft? |
| Option A: | Mechanical Energy |
| Option B: | Potential Energy |
| Option C: | Kinetic Energy |
| Option D: | Elastic Energy |
|  |  |
| **14.** | Buckets and blades used in a turbine are used to: |
| Option A: | Alter the direction of water |
| Option B: | Switch off the turbine |
| Option C: | To regulate the wind speed |
| Option D: | To regenerate the power |
|  |  |
| **15.** | **Reaction turbine requires** |
| Option A: | High head and low discharge |
| Option B: | High head and high discharge |
| Option C: | Low head and low discharge |
| Option D: | Low head and high discharge |
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| **16.** | **Which of the following is an impulse turbine?** |
| Option A: | Pelton turbine |
| Option B: | Francis turbine |
| Option C: | Kaplan turbine |
| Option D: | Propeller turbine |
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| **17.** | **Pelton turbine is \_\_\_\_\_\_** |
| Option A: | Tangential flow |
| Option B: | Radial flow |
| Option C: | Mixed flow |
| Option D: | Axial flow |
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| **18.** | Then biggest loss in the [boiler](about:blank) is..... |
| Option A: | Moisture in fuel |
| Option B: | Dry in flue gases |
| Option C: | Steam formation |
| Option D: | Unburnt carbon |
|  |  |
| **19.** | The ratio of heat actually used in producing the steam to the heat liberated in the furnace is called...... |
| Option A: | Steam efficiency |
| Option B: | Boiler efficiency |
| Option C: | Evaporation capacity of a boiler |
| Option D: | None of the above |
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| **20.** | Specific speed develops a unit power under a unit \_\_\_\_\_\_\_ |
| Option A: | Temperature |
| Option B: | Pressure |
| Option C: | Volume of the flow |
| Option D: | Head |
|  |  |
| **21** | The diameter of internal flue tubes of a Lancashire boiler is about........that of it's shell |
| Option A: | One-fourth |
| Option B: | One-third |
| Option C: | Two-fifth |
| Option D: | One-half |
|  |  |
| **22** | In a [centrifugal pump](about:blank) the liquid enters the pump ....... |
| Option A: | At the top |
| Option B: | At the bottom |
| Option C: | At the center |
| Option D: | From sides |
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| **23** | Indicator diagram of a reciprocating pump is a graph between.... |
| Option A: | Floor vs swept volume |
| Option B: | Pressure in cylinder vs swept volume |
| Option C: | Flow vs speed |
| Option D: | Pressure vs speed |
|  |  |
| **24** | Which of the following pumps is used for pumping viscous fluids...... |
| Option A: | Centrifugal pump |
| Option B: | Screw pump |
| Option C: | Reciprocating pump |
| Option D: | Jet pump |
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| **20.** | Which of the following boiler is best suited to meet the fluctuating demand of steam....... |
| Option A: | Locomotive boiler |
| Option B: | Lancashire boiler |
| Option C: | Cornish boiler |
| Option D: | Babcock and Wilcox boiler |
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| **25** | The economizer is used in boilers to...... |
| Option A: | Increase thermal efficiency of boiler |
| Option B: | Economies on fuel |
| Option C: | Extract heat from the exhaust the gases |
| Option D: | Increase flue gas temperature |
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| **26** | Which of the following is a water tube boiler..... |
| Option A: | Locomotive boiler |
| Option B: | Cornish boiler |
| Option C: | Cochran boiler |
| Option D: | Babcock and Wilcox boiler |
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| **27** | Which of the following is a fire tube boiler....... |
| Option A: | Locomotive boiler |
| Option B: | Cornish boiler |
| Option C: | Cochran boiler |
| Option D: | Babcock and Wilcox boiler |
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| **28.** | **Francis turbine is \_\_\_\_\_.** |
| Option A: | Tangential flow |
| Option B: | Radial flow |
| Option C: | Mixed flow |
| Option D: | Axial flow |
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| **29.** | Lancashire boiler is of....... |
| Option A: | Stationary fire tube-type |
| Option B: | Horizontal type |
| Option C: | Natural circulation type |
| Option D: | All of the above |
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| **30** | The number of fire tubes in Lancashire boiler is........ |
| Option A: | 0 |
| Option B: | 1 |
| Option C: | 2 |
| Option D: | 4 |
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| **Descriptive Questions Sample Set** |
| 1.Asingleactingtwostageaircompressordeliversairat18bar.ThetemperatureandpressureoftheairbeforethecompressioninL.P.Cylinderare25°Cand1bar.ThedischargepressureofL.P.Cylinderis4.2bar.Thepressureofairleavingtheintercooleris4barandairiscooledto25°C.ThediameterandstrokeofL.P.Cylinderare40cmand50cmrespectively.Theclearancevolumeis5%strokeinbothcylinders.Thespeedofthecompressoris200 r.p.m. Assuming the index of compression and re-expansion in both cylinders as 1.25, cp forair = 1.004 kJ/kg-K, find (a) power required to run the compressor, and (b) heat rejected in intercooler/min. |
| 2. Draw a neat sketch of various components of the centrifugal compressor and show the variation of pressure and velocity of air being compressed. |
| 3. In an impulse turbine (with a single row wheel) the mean diameter of the blade is 1.05 m10andthe speed is 3000 rpm. The nozzle angle is 180, the ratio of blade speed to steam speed is 0.42 and the ratio of the relative velocity at outlet from the blades to that at inlet is 0.84. The outlet angle of the blade is to be made 30 less than the inlet angle. The steam flow is 10 kg/s. draw the velocity diagram and find;  (i) Tangential thrust on the blades  (ii) Axial thrust on the blades  (iii) Resultant thrust on the blades  (iv)Power developed in the blades  (v) Blade efficiency. |
| 4.Derivetheexpressionfor optimum pressure ratio for maximum specific output in actual simple gas turbine cycle. |
| 5. The following data pertains to a certain gas turbine unit- 10 Inletconditiontocompressor=1barand270C,Efficiencyofcompressionofcompressor =80%,Pressureratio=4,Turbine inlet temperature=6000C,Turbine expansion efficiency =85 %,C.V. of fuel =42,000 kJ/kg,Forairflowrateof80kg/min. ,Determine-   * 1. Air-fuel ratio of the turbine plant,   (ii)Net power of the unit,  (iii)Over all efficiency of the plant.  Take for air, Cp=1.0 kJ/kgK, Cv =0.715 kJ/kgk.  Take for gas, Cp=1.1 kJ/kgK, Cv =0.725 kJ/kgk. |
| 6. The three jet Pelton turbine is required to generate 10,000 kW under a net head of 400 m.Thebladeangleatoutletis150andthereductionintherelativevelocitywhilepassing over the blade is 5%. If the overall efficiency of the wheel is 80%, Cv = 0.98 and speed ratio = 0.46, then find:  (i) The diameter of the jet  (ii) Total flow in m3/s  (iii) The force exerted by a jet on the buckets. |
| 7. Design a Francis turbine runner with the following data:  NetheadH=68m;speedN=750rpm;outputpowerP=330kW;ηh=94%;ηo=85%;flowratio ψ=0.15;breadthration=0.1;innerdiameterofrunneris½ofouterdiameter.Alsoassume6%of circumferentialareaoftherunnertobeoccupiedbythicknessofthevanes.Velocityofflow remains constant throughout and flow is radial at exit. |
| 8. Following observation were made during a test on steam boiler.Boilerpressure=10bar,calorificvalueoffuelused=33000kJ/kg,feedwatertemperatureenteringtheeconomizer=250C,andleavingtheeconomizer=800C,conditionofsteamleavingthesuperheater=2500C,steamconditionleavingtheboiler = 0.95, amount of water evaporated = 6000 kg/hr, amount of fuel burnt = 600 kg/hr.Find the equivalent evaporation with and without superheater, boiler efficiency, and the percentage of heat utilized in the boiler, economizer and the superheater. |
| 9. The air in a gas turbine plant is taken in at low pressure at 293 K and 1.05 bar and aftercompressionitispassedthroughintercooler,whereitstemperatureisreducedto300K. The cooled air is further compressed in high pressure compressor and then passed in the combustion chamber, where its temperature is increased to 7500C by burning the fuel.The combustion products expand in high pressure turbine which runs the compressor and further expansion is continued in low pressure turbine which runs the alternator. The gas coming out from low pressure turbine are used for heating the incoming air from high pressure compressor and then expanded to atmosphere. Pressure ratio of each compressor = 2, ηiso (each compressor stage) = 82%, ηiso (eachturbinestage)=82%,effectivenessofheatexchanger=0.72,airflowrate=16kg/s,C.V.offuel=42,000kJ/kg,Cv(air)=10kJ/kgK,Cp(gas)=1.15kJ/kgK,γair=1.4,γgas=1.33. Neglecting fuel mass calculate, (i) Power output, (ii) Thermal efficiency, (iii)Specific fuel consumption. |
| 10. A boiler produces 200 kg of steam per hour at 10 bar and 0.95 dry. Feed water is heated by an economizer to a temperature of 1100C. 225 kg of coal of calorific value of 30100 kJ/kg is fired per hour. If 10 % of coal remain unburnt, find the thermal efficiency of boiler and boiler and grate combined. |
| 11. At a stage in a reaction turbine, the mean blade ring diameter is 1 m and turbine runs at 5010rpm.Thebladesaredesignedfor50%reactionwithexitangle300andinletangle500.The turbine is supplied with steam at the rate of 60,000kg/hr and stage efficiency is 85%.  Determine:-  i) Power output  ii) Specific enthalpy drop in the stage in (kJ/kg)  iii) % increase in relative velocity |
| 12. Steam a velocity of 400 m/s relative to the moving blades enters an impulse turbine at anangleof30°.Thebladevelocityis20m/s.Theworkdevelopedinthebladesisestimated to be 165.54 kW/kg. Assuming the blades to be symmetrical ins hape, determine the blade efficiency and blade velocity coefficient. |
| 13. A simple turbojet unit operates with a turbine inlet temperature of 1000°C. Following data refers to design conditions: Compressor pressure ratio = 7, Compressor efficiency = 80%, Turbine efficiency = 80%, Nozzle efficiency = 95%, Mass flow rate of air = 20 kg/s, atmospheric pressure and temperature = 1 bar and 27 °C. Neglect mass of fuel. Calculate: design thrust, pressure, temp, velocity of jet. |
| 14. Why does c avitation occurs in reciprocating pump? Describe the ways to prevent cavitation. |
| 15. Explain the basic Euler’s theory applied to turbo Machines in detail. |

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| 16. Draw a neat sketch of various components of the centrifugal compressor and show the variation of pressure and velocity of air being compressed. |
| 17. Why centrifugal compressor is not suitable for air craft application? |
| 18. State the methods used for improving the performance of gas turbine powerplant. |
| 19. Compare the performance of Forward, Backward and Radial blade used in centrifugal Compressor. |
| 20. With neat sketch explain the principle of operation of Turbo-fan engine. |
| 21.. Differentiate between ramjet and pulsejet |
| 22.Writeashort note on: Classification of water turbine |
| 23. Differentiate water tube boilers with firetube boilers |
| 24. Write note on: Benson boiler |
| 25. Explain the function of draft tube with neat diagram |
| 26. What is an indicator diagram? What is its importance in reciprocating pumps? |
| 27. What is priming in centrifugal pump? Why it is necessary? |
| 28. Explain the performance characteristic curves of centrifugal pump. |
| 29.Makealist of any five boiler mountings and write their functions. |
| 30.Writeashort note on boiler accessories. |
| 31. Explain Compressible gas flow relations. |
| 32. State the condition for maximum hydraulic efficiency. |
| 33. DerivetheexpressionforairstandardefficiencyofidealBraytoncycleintermsof pressure ratio. |
| 34. Define slip, percentage slip and negative slip of reciprocating pump. |
| 35. What do you mean by surging,coking and stalling? |