Subjective questions on MET-07

Q1: What is the subject matter of Thermodynamics? How is it helpful in understanding the working of a heat engine?

Q2: Explain the difference between classical and statistical approach in thermodynamics?

Q3: What is quasi- equilibrium process? Explain its importance in engineering.

Q4: What are the properties of a gas? State the various Gas Laws.

Q5: State the facts about the following:
    i) Perfact gas
    ii) Real Gas
    iii) Noble Gases
    iv) Steam

Q6: Obtain an ideal gas from Boyle's law and Charles' law.

Q7: A 1 m^3 tank is filled with a gas at room temperature 25ºC and pressure 100Kpa. How much mass is there if the gas is
    a) Air
    b) Neon
    c) Propane

Q8: Explain the kinetic model of gas in detail.

Q9: Explain the physical significance of Van der Waals equation. How does it differ from the Ideal gas equation?

Q10: What are the various thermodynamic processes of the gases? What are the important parameters of a perfect gas? Which of them are useful in deriving Work?

Q11: State and explain the Laws of Thermodynamics. Support you answer with the help of flow diagrams.

Q12: With the help of a neat diagram, explain the method of calculating work done in a thermodynamic cycle?

Q13: Show how Zeroth Law of thermodynamics used for temperature measurement.

Q14: Prove that difference in specific heat capacities equal to $C_p - C_v = R$.

Q15: Write the steady flow energy equation with assumptions. Simplify it to be applicable for gas turbine and compressor.

Q16: Derive the Tds relation in terms of change in temperature and volume.

Q17: Explain polytrophic process. Derive the expression for work done in polytrophic process.

Q18: Air at 150kPa and 323K is filled in a rigid vessel of 0.05m^3 capacity. If 30KJ of heat is added then find the final temperature. Assume air as an ideal gas.

Q19: One Kmol of an ideal gas at 300 K and 10 bar is reversibly heated in a constant volume process upto 500K.It is then reversibly and isothermally expanded to 2 bar. Calculate the total heat supplied to the gas. Take C_v =20.8 KJ/kmol.K and R = 8.314 KJ/kmol.K

Q20: What is Steam? What is the difference between Steam and Superheated steam? How is it harnessed to derive work?

Q21: What is a cyclic process in a thermodynamic system? What are Reversible and Irreversible cycles? Explain with the help of a diagram.

Q22: Briefly explain the following terms:
i) Sensible Heat   ii) Latent Heat iii) Superheated steam   iv) Dryness fraction
 v) total heat of wet steam   vi) Specific volume

Q23: Explain the process of steam formation with T-S diagram.

Q24: Sketch the ideal Rankine cycle on p-V, T-s and h-s diagram for dry saturated steam inlet to the turbine and derive the relation for efficiency.

Q25: What information can be found in steam table? What is the effect of increase in pressure on saturation temperature, enthalpy of saturated water, enthalpy of dry saturated steam and enthalpy of evaporation?

Q26: In a work-cycle four processes are involved, namely: A-B; B-C; C-D and D-A. Their associated Pressures and change in Volumes are given here under:

S. No.	Process	Pressure (10^3 N/M^2)	Change in Volume 0.001 M^3
1.	A-B	8.0	20.0
2.	B-C	5.5	0
3.	C-D	3.0	-20.0
4.	D-A	5.5	0

i) Calculate the work done in each process.
ii) Calculate the net work done in the cycle.

Q27: What do you understand by a Heat Engine? How many types of are these? How they are classified? Explain.

Q28: Show that the efficiency of reversible heat engine depends only on the maximum and minimum absolute temperature in the cycle.

Q29: Explain the reverse carnot cycle with neat sketch.

Q30: What is an Internal Combustion (IC) engine? Name and explain the working principle of any two of these.

Q31: What is the difference between an External Combustion Engine and Internal Combustion Engine? Support your answer with suitable diagrams.

Q32: What are the differences between otto and diesel cycle?

Q33: Derive the relation for efficiency of Dual Engine cycle.

Q34: What are the desirable properties of good IC engine fuel? Explain in details.

Q35: Compare the efficiencies of otto cycle, diesel cycle and dual cycle on different aspects with the help of P-V and T-S diagram.

Q36: Explain about different parts of IC engine with neat sketch.

Q37: Explain open and closed type of gas turbine plants.

Q38: What is meant by abnormal combustion? Explain the phenomenon of knock in S.I. engine.

Q39: An IC engine having 6 cylinders works on otto cycle. It has a bore of 20cm and a stroke of 40 cm. Clearence volumes is 9000cm^3. Calculate the compression ratio.

Q40: A four stroke reciprocating engine has cylinder diameter 4cm, stroke length of 7cm and clearance volume 2cm^3. Find the engine capacity in CC.

Q41: What do you understand by a Stroke in the terms of heat engine? Make out the difference between a two stroke engine and a four stroke engine.

Q42: What is cooling system? Mention its types. What are the disadvantages of overcooling?

Q43: Explain briefly various alternate fuels that can be used in IC engine.

Q44: State the essential requirements of diesel injection system.

Q45: Describe the methods used to measure break power of IC engine.

Q46: What is lubrication? Explain its types with suitable examples.

Q47: Mention the merits and demerits of alcohol as a fuel for CI engine.

Q48: Discuss the formation of HC, CO and No in SI engine.

Q49: Explain the parameters by which the performance of engine is evaluated.

Q50: Calculate the indicated mean effective pressure for 4 stroke cylinder engine that produces 24 KW of power at engine crankshaft at 2000 rpm having mechanical efficiency as 80%. Consider engine swept volume as 900cc and stroke length as 9 cm.

Q51: What is the function of compressor? Briefly explain its types.

Q52: What is the difference between reciprocating and centrifugal compressor. Explain with neat sketch.

Q53: What do you mean by volumetric efficiency? Derive its relation for reciprocating compressor.

Q54: Derive the relation for indicated work in reciprocating compressor.

Q55: What is cavitation? Explain about its causes and remedies.