MODEL QUESTION PAPER

Subject Code: 110006

Subject Name: Elements of Mechanical Engineering

Remembrance based sample questions	
Question No	*Question Description*
A1	Recall Zeroth law and the first law of thermodynamics.
A2	Enlist different mountings of a boiler system.
A3	Reproduce the definition of (1)Prime mover (2) Boundary (3) Thermodynamic system
A4	Recall an example of non-ferrous metal and mention its properties.
A5	Reproduce the definition of following terms associated with pumps (1) Priming (2) Head (3) Air chamber
A6	Define following terms (1) Latent heat (2) Sensible heat (3) Dryness fraction
A7	Mention the S.I. Units of Following parameters:

	(1) Work (2) Enthalpy (3) Mean effective pressure (4) Heat (5) Power (6) Force
A8	State the primary function of the following (1) Pressure gauge (2) Fusible plug (3) Safety valve

Understanding based sample questions	
Question no	*Question description*
B1	Describe with appropriate sketching: Concept & working of a Four stroke petrol engine.
B2	Conceptualize the working of a diffuser based centrifugal pump; draw a neat sketch and labeling its parts.
B3	Explain the principle of a boiler and conceptualize the working aspects of a locomotive boiler along with a neat sketch and labeling its parts.
B4	Explain the principle of Boyle's law and Charle's law and arrive at the expression of PV/T=constant using the same.
B5	Explain the principle of the following and also spot the key differences between the two: i) Brake and Clutch ii) Governor and flywheel
B6	Illustrate with neat and labeled sketches. (i) Open belt drive (ii) Quarter twist drive (iii) Fast and loose pulley drive
B7	Explain the concept of vapor compressor refrigerating system along with neat sketch and cite suitable application of such a system.

Application and Analysis sample questions	
Question no	*Question description*
C1	The following information was recorded during the testing of a combined separating and throttling calorimeter. (1) Pressure of steam in a main steam pipe = 9.0 bar. (2) Pressure after throttling = 1.0 bar. (3) Temperature after throttling =115 degree centigrade. (4) Mass of steam condensed after throttling = 1.8 Kg (5) Mass of water collected in the separator = 0.2 Kg. Based on the above data, calculate the dryness fraction of the steam in the

	main pipe. And share your inferences about improving the steam quality.
C2	A steel cylinder containing oxygen (O_2) has the following parameters: 1. Pressure of 25 bar 2. Temperature of 27°C After using some quantity of the gas from the cylinder, the pressure dropped to 5 bar and the temperature to 20°C. In the cylinder, originally 700 litters of O_2 was present when measured under NTP. The density of O_2 at NTP is 1.43 gm/lit. Calculate the mass of O_2 use from the cylinder.
C3	In an Auto Industry a single stage air compressor is working with the following mentioned conditions of pressure and temperature (Note: Neglect Clearance during the analysis) 1. Initial temperature : 15°C 2. Initial pressure: 1 bar In order to affect the needed transformation it is required to translate to the following mentioned temperature and pressure to compress 72 m^3 of air per minute. Condition 1: Isothermal Compression 3. Final temperature : 15°C 4. Final pressure: 8 bar Condition 2: Polytropic Compression (with compression utilizing the $PV^{1.25}$ = Constant) 5. Final temperature: ? 6. Final pressure: 8 bar Also find: Work done, power consumed and heat rejected during each of the above mentioned conditions.
C4	In an industrial setup, the air standard Otto cycle has the following parameters: (Note: Take C_v = 0.718 kJ/kg K and Isentropic index = 1.4) 1. Range : maximum temperature (1673 K), and minimum temperature (288 K). 2. Amount of heat supplied per kg of air = 800 kJ. Calculate : (1) Compression ratio (2) Efficiency (3) Maximum and minimum pressures.
C5	In a pharmaceutical industry two boilers are aligned to discharge steam

	through a common manifold. The details are as follows: Boiler A discharge at: Pressure 10 bar and Temperature 350 ºC Boiler B discharge at: Pressure 10 bar and dryness fraction 0.9 Boiler A and B discharges equal amount of steam. Calculate the condition of steam after mixing in the common manifold discharge pipe.
C6	Compare the following and cite appropriate real world applications (Note: Draw necessary diagrams) (1) Rankine cycle and Carnot cycle (2) Otto cycle and Diesel cycle
C7	Differentiate following cite appropriate real world applications (Note: Draw necessary diagrams) (1) Fire tube boiler and water tube boiler (2) Gear drive and belt drive