

3RD SEM. /ELECTRICAL/ 2023(W) NEW

Th-3 Elements of Mechanical Engineering

Full Marks: 80

Time- 3 Hrs

**Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks
Use of Steam Table and Mollier Diagram is allowed**

1. Answer **All** questions 2 x 10
- a. State first law of thermodynamics.
 - b. What is the function of water level indicator of a boiler.
 - c. Define boiler accessories with example.
 - d. Petrol engine works in which cycle and write down its efficiency in mathematical formula.
 - e. Define reaction turbine with examples.
 - f. Define dryness fraction of steam and what is the value of dryness fraction of steam for dry saturated steam?
 - g. What is the function of Hydraulic Ram?
 - h. Define heat and its unit.
 - i. What is mean effective pressure of a steam engine?
 - j. What are the pressure measuring instruments?
2. Answer **Any Six** Questions 6 x 5
- a. Describe properties of fluid.
 - b. Compare between Jet condenser and surface condenser.
 - c. How boilers are classified ?
 - d. Derive an expression to determine hypothetical mean effective pressure of a steam engine without clearance.
 - e. Differentiate between two stroke and four stroke engine.
 - f. Differentiate between impulse turbine and reaction turbine.
 - g. Explain U-tube manometer and piezometer.
3. a Define Bore. 2
- b Determine the stroke and diameter of double acting steam engine cylinder 8
developing 180kw under the following conditions.
Initial steam pressure 7bar
Back pressure 1.12bar
Crank speed 100r.p.m.
Average piston speed 135m/min
Diagram factor 0.8
Cut-off at 0.4 of the stroke.

- 4 State and prove Bernoulli's Theorem. 10
- 5 Steam is being generated in a boiler under a pressure of 12bar. Find the enthalpy 10
5kg of steam. When
- (i) Steam is wet having dryness fraction of 0.75.
 - (ii) Steam is dry and saturated
 - (iii) Temperature of steam is 300°C . Take $C_p = 2.1\text{KJ/kg}\cdot\text{K}$.
- 6 (a) Explain two stroke diesel engine with neat sketch. 10
(b) What is the function of Hydraulic lift and describe working principle of Hydraulic lift with neat sketch.
- 7 (a) What is the difference between pascal and bar. 2+8
(b) With a neat sketch explain construction and working of Cochran boiler.