3RD SEM/ ELECTRICAL/ 2022(W)

Th-3 Element 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

1. Answer **All** questions 2 x 10

a. What do you understand by Indicated Horse Power of an engine?
b. Define super-heated steam.
c. State the use of accumulator in a hydraulic circuit.
d. State 1st Law of Thermodynamics.
e. What is the difference between Density and Weight Density?
f. Define condenser.
g. How an IC Engine works?
h. What is the function of a pump?
i. State the Continuity Equation.
j. Name the different types of Boilers.

2. Answer **Any Six** Questions 6 x 5

a. A pipe 400 mm diameter is branched into two pipes of diameter 250 mm and 110 mm respectively. If the average velocity in 400 mm diameter pipe is 2.1 m/sec and average velocity in 250 mm diameter pipe is 2 m/sec then find the velocity in 110 mm diameter pipe and total discharge.
b. Explain Specific Weight, Dynamic Viscosity and Surface Tension of a fluid.
c. Define surface condenser? List the merits and limitations of a condenser.
d. Compare Wet Bulb Temperature with Dry Bulb Temperature.
e. Differentiate Hydraulic devices and Pneumatic devices.
f. What is an intensifier? State its use in a hydraulic/pneumatic circuit.
g Derive the relationship of specific heat of gases at constant volume and constant pressure.

3 State Bernoullii's Theorem. Derive the equation. 10

4 Explain about 2-stroke Diesel Engine with neat sketch. 10

5 Define Pressure. Discuss briefly about different pressure measuring instruments. 10

6 Describe about Boiler Mountings and Accessories. 10

7 A cylinder contains 1.1 kg of steam at 1 MPa. If the volume of steam is 0.09 m^3, determine the dryness fraction of the steam, enthalpy and internal energy of the steam per kg.

3RD SEM./ELECTRICAL/2020(W)/ OLD

MET-321-ELEMENTS OF MECHANICAL ENGINEERING

Full Marks: 80 Time : 3 Hours

Answer any Five Questions including Q No. 1& 2

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Calculator & Steam table are allowed

1. Answer all the question 2X 10

(a) What is first law of thermodynamics?
(b) State the unit heat and work.
(c) State the Charle's law of a perfect gas.
(d) What is mean effective pressure?
(e) What is Fire tube boiler with example?
(f) Define dryness fraction.
(g) What is the meaning boiler Accessories with example?
(h) Define I.P and B.P of an IC engine.
(i) What is Surface tension?
(j) State the Pascal's Law.

2. Answer any six: 5 X6

(a) Determine relationship of specific heat of gases at constant volume and constant pressure.
(b) Differentiate between boiler mounting and boiler accessories
(c) Describe any one of the Fire tube boiler with neat sketch.
(d) Differentiate between impulse turbine and reaction turbine.
(e) Describe briefly about Hydraulic lift with neat sketch.
(f) Calculate the enthalpy of 1 kg of steam at a pressure of 10 bar and dryness fraction of 0.9. How much heat would be required to rise 2 kg of this steam water at 50^0 c?
(g) Compare between jet condenser and surface condenser.

3. *Explain the principle of simple steam engine with neat sketch* 10

4. *State and explain Bernoulli's theorem* 10

5. What is meaning of I.C. Engine and describe briefly about two stroke petrol Engine with neat sketch 10

6. A double acting reciprocating steam Engine have the diameter is 500mm, stroke of the piston is 400mm, speed 150r.p.m, steam pressure is 10 bar and 0.9 dry, the back pressure is 1.5 bar and cut – off take place 50% of stroke for both ends. Calculate the indicated power and steam consumption in kg/h 10

7. State about 2X5

(a) Hydraulic Intensifier
(b) Hydraulic Accumulator

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Th-3 Element of Mechanical Engineering

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Answer any five Questions including Q No.1& 2
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1. Answer **All** questions 2 x 10
   a. State the 1st law of thermodynamics.
   b. Define dryness fraction and quality of steam.
   c. Name two mountings and two accessories of a boiler.
   d. Define the mean effective pressure.
   e. State the basic difference between IC engine and EC engine with one example of each.
   f. What is D-slide valve?
   g. Define fluid.
   h. What do you mean by indicated power and brake power and efficiency?
   i. State the law of continuity in fluid.
   j. State the uses of a pneumatic system.

2. Answer **Any Six** Questions 6 x 5
   a. Differentiate between two stroke and four stroke engine.
   b. What is a surface condenser? What are the advantages and disadvantages over jet condenser?
   c. Derive the relationship between C_p and C_v.
   d. Differentiate between an impulse turbine and a reaction turbine.
   e. Describe briefly the different properties of fluid.
   f. A pipe 450mm diameter is branched into two pipes of diameter 300mm and 200mm respectively. If the average velocity in 450mm diameter pipe is 3m/sec and average velocity in 300mm diameter pipe is 2.5m/sec than find velocity in 200mm diameter pipe and total discharge.
   g Explain the working of hydraulic intensifier.

3 A cylinder contains 0.92kg of steam at 1.5MPa. If the volume of steam is $0.1m^3$, determine the dryness fraction of the steam, enthalpy and internal energy of the steam per kg. 10

4 The right limb of a U-tube manometer containing through which flows a liquid of specific gravity of 0.85. The centre of the pipe is 10cm below the level of mercury in the right limb. If the difference in mercury levels in two limbs is 16cm. Find the pressure in the pipe. 10

5 State Bernoulli's theorem and derive the equation. 10

6 Determine the diameter and stroke of a double acting steam engine developing 180kW under the following conditions. Initial steam pressure 7bar , back pressure 1.12bar, crank speed 100rpm, mean piston speed 135m/min, diagram factor 0.8 and cut off takes place at 0.4 of the stroke. 10

7 Define boiler. With neat sketch explain any water tube boiler. 10

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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 developing 180kw under the following conditions. 8
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.

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