



ARKA JAIN University, Jharkhand

2nd Semester Final Examination – 2019

Subject: Elements of Mechanical Engineering

Time: 2 Hours

Course: ~~BA-ALL~~ BTECH

Full Marks: 35

Pass Marks: 10

- Candidates are required to give their answers in their own words as far as practicable.
- Question Paper is divided into **Three Parts –A,B& C**
- **Part-A** is compulsory.
- **Part- B** contains **SIX** questions out of which **FOUR** questions are to be answered.
- **Part- C** contains **Two** questions out of which **ONE** questions are to be answered.

PART A

Q.1) All questions are compulsory

A) Multiple choice questions

(10X1=10)

i) One calorie in heat unit is equal to

a) 4 joule

b) 4.2 joule

c) 5.7 joule

d) 8 joule

ii) Which one of the following are intensive properties

a) Enthalpy

b) Entropy

c) Volume

d) Pressure

iii) Which one of the following are fissile material in nuclear power plant

a) U^{235}

b) U^{238}

c) Pu^{239}

d) Th^{232}

iv) Which one of the following are path functions

a) heat

b) work

c) pressure

d) temperature

v) Which one of the following are boiler mountings

a) Water level indicator

b) Economiser

c) Air pre heater

d) Pressure gauge

vi) Which one of the following are reaction turbine

a) De-Laval

b) Curtis

c) Parson

d) None

vii) The carbon content in cast iron varies from

- a) 1.7 to 4.5 %
- b) maximum up to 1.5%
- c) 0.020%
- d) None

viii) The working fluid in vapour absorption refrigeration is

- a) Ammonia
- b) Air
- c) Carbon dioxide
- d) R-14

ix) The material commonly used for machine tool bodies is

- a) Mild steel
- b) Wrought iron
- c) Cast iron
- d) Nickel steel

x) One tonne of refrigeration means

- a) 3.5 Kw
- b) One tonne of ice
- c) 4 Kw
- d) None

B) Very Short Question

(5x2=10)

- a) Mention the purpose of heat treatment and name the various types of heat treatment processes.
- b) Explain the following mechanical properties of metals:- strength, hardness, resilience and creep.
- c) Advantages and disadvantages of vapour absorption over vapour compression refrigeration system.
- d) With a neat diagram explain the working of a thermal power plant.
- e) Differences between a two-stroke and four-stroke IC engine.

PART B

Q.2) Answer Any Four

(4x5=20)

- i) With a neat diagram name the different parts of a Babcock and Wilcock boiler and explain its working.
- ii) Write down the first law of thermodynamics and extend it for an open system with steady state flow condition.
- iii) With a neat diagram explain the working of a Nuclear Power Plant. Name some fissile fuels and also fertile materials.

- iv) With a neat diagram show the various components of a vapour compression refrigeration system and explain its working.
- v) What is meant by heat treatment of steel? Explain the following heat treatment processes- annealing, normalising and tempering.
- vi) What is an alloy steel? What is the effect of the following alloying elements on steel? Nickel, Chromium, Manganese and Vanadium.

PART C

Answer Any Three

(3x10=30)

Q3) Explain the working principle of a gas turbine with a neat diagram and explain the various processes of a closed system gas turbine. Draw the P-V and T-S diagram and obtain an expression for turbine work and work required by the compressor.

Q4) What is meant by the mechanical properties of the metals? Explain any five important mechanical properties.

Q5) What is stainless steel? Explain Martensitic, Ferritic and Austenitic stainless steel.

Q6) What is meant by one tonne of refrigeration? With a neat diagram show the components of an air refrigeration system based on Bell- Coleman Cycle. Show the various processes in P-V and T-S diagrams.

Q7) What is a steam turbine? Make a comparison between an Impulse and Reaction turbine. Name the various components of an Impulse turbine. Draw the velocity diagram and an expression for power developed by an **impulse turbine**.

Q8) Differentiate between boiler Mountings and Accessories and name a few of them. Explain the working of a Cochran boiler with a neat diagram and compare it with a simple vertical boiler.