

Sample Test Paper - I

Course Name :-Diploma in Electrical Engineering Group

Course Code :-EE/EP

Semester :-Fourth

Subject Title :-Elements of Mechanical Engineering

Marks :- 25

17413

Time:1 hour

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**Instructions:**

1. All questions are compulsory
2. Illustrate your answers with neat sketches wherever necessary
3. Figures to the right indicate full marks
4. Assume suitable data if necessary
5. Preferably, write the answers in sequential order

**Q1. Attempt any THREE**

**(9 Marks)**

- a) Classify the steam boilers.
- b) Explain how boiler efficiency is calculated?
- c) List out the main components of I.C. engine.
- d) Explain the detonation in I.C. engine?

**Q2. Attempt any TWO**

**(8 Marks)**

- a) Explain with neat sketch reaction turbine.
- b) The following data were recorded during a test on an oil engine: speed of the engine=1000r.p.m.; load on the brake= 1000N ; length of the brake= 750mm. Determine brake torque and brake power of the engine.
- c) Explain the working of starting motor for I.C. engine.

**Q3. Attempt any TWO**

**(8 Marks)**

- a) Differentiate between two stroke and four stroke engine.
- b) For impulse turbine: Mean diameter of blade ring =2.5 m, speed =3000 r.p.m.; nozzle angle = $20^{\circ}$  ;ratio of blade velocity to steam velocity =0.4 ; blade friction factor=0.8; blade angle at exit = $3^{\circ}$  less than that an inlet; steam flow =36000kg/h. Estimate power developed and blade efficiency.
- c) What is governing of steam turbine?

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**Q1. Attempt any THREE**

**(9 Marks)**

- a) Define compression ratio and compressor capacity.
- b) State the advantages of multistage compression.
- c) What is the meaning of NPSH and define it.
- d) Write three applications of centrifugal pump.

**Q2. Attempt any TWO**

**(8 Marks)**

- a) Explain with sketch centrifugal air compressor.
- b) Find power required to drive the centrifugal pump which delivers  $0.05 \text{ m}^3$  of water per second to a height of 22 m through a 16 cm diameter pipe of 120 m length. The overall efficiency of the pump is 75%. (take coefficient of friction,  $f=0.015$ )
- c) Compare reciprocating and rotary air compressor. (Min. Four points)

**Q3. Attempt any ONE**

**(8 Marks)**

- a) A centrifugal air compressor having a pressure compression ratio of 5 compresses air at the rate of 10 kg/s. If the initial pressure and temperature of the air is 1 bar and  $20^0 \text{ C}$ , find; the final temperature of gas and power required to drive the compressor. Take  $\gamma=1.4$  and  $c_p = 1 \text{ KJ/kg K}$ .
- b) What is an air vessel? Describe the function of air vessel for reciprocating pump.
- c) Draw neat labelled sketch of vortex casing and volute casing for pump.

**Scheme -G**

**Sample Question Paper**

**Course Name :-Diploma in Electrical Engineering Group**

**Course Code :-EE/EP**

**17413**

**Semester :-Fourth**

**Subject Title :-Elements of Mechanical Engineering**

**Marks :- 50**

**Time:2 hour**

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**Instructions:**

1. All questions are compulsory
2. Illustrate your answers with neat sketches wherever necessary
3. Figures to the right indicate full marks
4. Assume suitable data if necessary
5. Preferably, write the answers in sequential order

**Q1. Attempt any NINE of following**

**(18 Marks)**

1. Give classification of turbine based on
  - i) Action of Steam
  - ii) Method of Governing
2. State two provisions under Boiler Act for remedial measure.
3. Define break power and indicated power.
4. State use of compressed air and define free air delivered.
5. List the types of pumps.
6. List any two applications of impulse and reaction turbine.
7. State the reasons for over losses in turbine.
8. Draw labelled sketch of centrifugal compressor.
9. A single reciprocating pump having bore of 150 mm and stroke 300 mm and running at 50 rpm has to deliver water through 20 m height. Find power required to drive the pump.
10. State four industrial applications of compressed air.
11. Define suction head and delivery head of centrifugal pump.

**Q2. Attempt any FOUR of following****(16 Marks)**

1. Draw neat labelled sketch of Cochran boiler.
2. Write the functions of following parts in I.C. engine.
  - a) Piston
  - b) Crank
  - c) Piston ring
  - d) Cylinder
3. Explain with neat sketch working of vane type rotary compressor. Write two applications.
4. Explain priming of a centrifugal pump.
5. Steam at 8 bar and 0.85 dry is expand to 1 bar by constant enthalpy process. Using steam table find dryness fraction (quality of steam). Also calculate change in entropy.
6. Explain the working principle of starting motor for I.C. engine.

**Q3. Attempt any FOUR of following****(16 Marks)**

1. Differentiate between fire tube boiler and water tube boiler. (Min. Four points)
2. During the test on single cylinder oil engine working on the four stroke cycle and be fitted with a rope brake , the following reading are taken;
  - Effective diameter of brake wheel=631 mm
  - Spring balance reading =31 N
  - Speed = 455 rpm
  - Dead load on brake = 202 N
  - Area of indicator diagram = 422 mm<sup>2</sup>
  - Length of indicator diagram =62 mm
  - Spring scale = 1.2 bar/mm
  - Diameter of cylinder = 100 mm
  - Stroke = 151 mm

Calculate brake power and indicated power.

3. Explain the methods of energy saving in an air compressor. (Any Four)
4. Draw a neat labeled sketch of multi-stage centrifugal pump and explain its working.
5. Write down the four applications of reciprocating compressor and rotary compressor.
6. What are the different types of impeller? Where these types are used.