

KADI SARVA VISHWAVIDYALAYA
B.E Semester-II (NEW) JUNE-2023

Subject: Fundamental of Mechanical Engineering
Subject Code: CC-104-N

Date: 24/06/2023
Time: 10:00 am to 01:00 pm
Total Marks: 70

Instructions:

1. Answer each section in separate Answer sheet.
2. Use of Scientific calculator is permitted.
3. All questions are **Compulsory**.
4. Indicate **clearly**, the options you attempt along with its respective question number.
5. Use the last page of main supplementary of **rough work**.

SECTION-I

Que:1 (A) Write only the statement of Zeroth law, first law and second law of thermodynamics. [5]

(B) What is prime mover? Also write down the various sources of energy. [5]

(C) State Boyle's and Charle's laws. [5]

OR

(C) Prove that work done during isothermal process is given by
 $W = p_1 v_1 \log(v_2/v_1) = p_1 v_1 \log(p_1/p_2)$. [5]

Que:2(A) Derive equation for Carnot vapour cycle. [5]

(B) Write short note on separating calorimeter. [5]

OR

(A) Derive thermal efficiency formula for Rankine cycle. [5]

(B) Write short note on Dryness fraction and wet steam. [5]

Que:3(A) Explain with neat sketch the working of Babcock and Wilcox boiler [5]

(B) Write short note on refrigerants used in refrigeration system. [5]

OR

(A) What do you mean by mounting and accessories? Enlist list of boiler mountings and accessories. [5]

(B) Explain with neat sketch Four stroke petrol engine. [5]

SECTION-II

Que:4(A) Difference between petrol and diesel engine. [5]

(B) Define and explain Air compressor. [5]

(C) Describe with neat sketch, the working of Watt Governor. [5]

OR

(C) A 6 cylinder 4 stroke IC engine is to produce 95 KW brake power at 800 rpm. The stroke to bore ratio is 1.25. Mean effective pressure is 7 bar. Determine the bore and stroke of the engine. Assume mechanical efficiency as 80%. [5]

Que:5(A) What are the advantages and disadvantages of liquid fuels over solid fuels? [5]

(B) Write a short note on: Types of belt drive. [5]

OR

(A) Describe any three types of gears in short. [5]

(B) Write a short on double acting reciprocating pump. [5]

- Que:6(A) Classify engineering materials & metals. [5]
(B) Explain working principle of steam turbines. [5]

OR

- (A) Define Welding, Soldering and Brazing. [5]
(B) 0.5 m^3 of air at pressure 1 bar is compressed at constant temperature until its volume is 0.2 m^3 . What is then its pressure? The air is then heated under constant pressure and its temperature is 75°C . Determine its volume and mass. [5]
Assume compression take place at 20°C and $R = 287 \text{ J/kg/K}$.

Best of luck

KADI SARVA VISHVAVIDHYALAYA
B.E. SEM I/II (REGULAR) (JANUARY 2023)

Subject Code: CC-104 N Subject Name: Fundamentals of Mechanical Engineering

Date: 24-01-2023

Time: : 10 a.m.- : 1 p.m.

Total Marks: 70

Instructions:

1. Answer each section in separate Answer Sheet.
2. Use of Scientific calculator is permitted.
3. All questions are **compulsory**.
4. Indicate **clearly**, the options you attempt along with its respective question number.
5. Use the last page of main supplementary of **rough work**.

Section – I

- Q 1** (A) Write on Cochran boiler with neat sketch. [5]
(B) Prove that $C_p - C_v = R$ with usual notations. [5]
(C) Explain and classify the thermodynamic system with suitable engineering examples of each. [5]

OR

- (C) Explain "Isothermal process". Prove equations for (i) work done, (ii) heat transfer for an Isothermal process. [5]
- Q 2** (A) Compare 2 stroke engine and 4 stroke engine. [5]
(B) Derive thermal efficiency formula for Carnot cycle. [5]

OR

- Q 2** (A) Differentiate between SI and CI engine. [5]
(B) In an Otto cycle the compression ratio is 10. The temperature at the beginning of compression and at the end of heat supplied is 300 K and 1600 K respectively. Assume adiabatic constant $\gamma = 1.4$ and $C_v = 0.717 \text{ KJ/Kg-K}$. Find (i) Heat supplied (ii) Air standard efficiency of cycle. [5]
- Q 3** (A) Explain with a neat sketch the working of a Vapour Compression Refrigerator (VCR). [5]
(B) Why steam is superheated? Give the advantages and disadvantages of superheated steam. [5]

OR

- Q 3** (A) Define air conditioning. Also write down the classification of air conditioning system. [5]
(B) What is Boiler? Explain Classification of Boilers [5]

Section – II

- Q 4** (A) Enlist various mechanical properties of metals. Define ductility and toughness. [5]
(B) Why Mechanical power transmission required in different applications? What are the different types of mechanical power transmission devices? [5]
(C) What is the function of pump, classify the pumps. [5]

OR

- (C) Explain with neat sketch working of centrifugal pump. [5]
Q 5 (A) What do you understand by positive displacement compressor? How it differs from roto dynamic compressor? [5]
(B) Write on Welding, Soldering and Brazing with their applications. [5]

OR

- Q 5** (A) Write a short note on: types of belt drive. [5]
(B) State the applications, advantages and disadvantages of:
(i) Rope drive (ii) Chain drive (iii) Gear drive. [5]
Q 6 (A) What are the advantages and disadvantages of liquid fuels over solid fuels? [5]
(B) Define mode of heat transfer with suitable examples. [5]

OR

- Q 6** (A) Classify engineering materials and metals. [5]
(B) Differentiate between the functions of a governor and flywheel. [5]

*** all the best ***

KADI SARVA VISHVAVIDHYALAYA
B.E. SEM I/II (REGULAR) (JULY 2022)

Subject Code: CC-104 N Subject Name: Fundamentals of Mechanical Engineering

Date: 14- 07 - 2022

Time: 10:30 a.m.-1:30 p.m.

Total Marks: 70

Instructions:

1. Answer each section in separate Answer Sheet.
2. Use of Scientific calculator is permitted.
3. All questions are **compulsory**.
4. Indicate **clearly**, the options you attempt along with its respective question number.
5. Use the last page of main supplementary of **rough work**.

Section – I

- Q 1** (A) Discuss closed, open and isolated thermodynamic system with neat sketch. [5]
(B) Derive characteristics equation of a perfect gas with the help of Boyle's law and Charles's law. [5]
(C) Explain Lancashire boiler with neat sketch. [5]

OR

- (C) Explain working and construction of economiser. [5]
Q 2 (A) Derive thermal efficiency formula for Rankin cycle. [5]
(B) Explain four stroke petrol engine with neat sketch. [5]

OR

- Q 2** (A) Air enters a compressor at 0.4 MPa and 27° C having volume of 2 m³/kg is compressed to 1 MPa isothermally calculate: [5]
(i) work done (ii) change in internal energy (iii) heat transferred.
(B) Explain two stroke diesel engine with neat sketch. [5]
Q 3 (A) Define air conditioning. Classify air conditioning system. [5]
(B) Write short note on throttling calorimeter. [5]

OR

- Q 3** (A) Write on vapour absorption refrigeration system with neat sketch. [5]
(B) Derive work done and heat transfer equation for polytropic process. [5]

Section – II

- Q 4** (A) What are the factors affecting the selection types of mechanical drives? [5]
What are the different types of mechanical drives?
(B) Define: (i) strength (ii) stiffness (iii) hardness (iv) toughness (v) ductility [5]
(C) Define air compressor and classify air compressor. [5]

OR

- (C) What is priming? Why is it required for a centrifugal pump? [5]
Q 5 (A) Compare reciprocating and rotodynamic compressor. [5]
(B) Write short note on: hot working and cold working of metals. [5]

OR

- Q 5** (A) Explain the working of fast and loose pulley with neat sketch. [5]
(B) Write advantage of chain drive over belt drive. [5]
Q 6 (A) What is a flywheel? What are its functions? [5]
(B) Explain briefly various types of gaseous fuels. [5]

OR

- Q 6** (A) Classify engineering materials and metals. [5]
(B) Write on mode of heat transfer in Mechanical system. [5]

--- all the best ---

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KADI SARVA VISHWVIDHYALAYA**B.E.Semester: I/II[REGULAR]****Subject Code: CC 104-N****Subject Name: Fundamental of Mechanical Engineering****Date: 12/04/2022****Time: 12:30 P.M. - 3:30 P.M.****Total Marks: 70****Instructions:**

1. Attempt all questions as directed and answer each section in separate main answer sheets.
2. Figures to the right indicate full marks.
3. Make suitable assumptions.
4. Indicate Clearly, the option you attempt along with its respective question number.
5. Use the last page of main supplementary for rough work.
6. Use of scientific calculator is permitted.
7. Please don't write anything on this question paper except your ID Number.
8. Please keep your Identity Cards and Hall Tickets on your desk during the examination.
9. Please follow all the instructions provided by authorized university and institute personnel.

SECTION - I**Q.1****Total: 15**

- A. The gas constant for atmospheric air is 0.287 kJ/kg K and its specific heat at constant volume is 0.7 kJ/kg K . Find the value of C_p and γ . **05**
 - B. A 6 cylinder 4 stroke IC engine is to produce 95 KW brake power at 800 rpm . The stroke to bore ratio is 1.25 . Mean effective pressure is 7 bar . Determine the bore and stroke of the engine. Assume mechanical efficiency as 80% . **05**
 - C. What is intensive and extensive property? Give the examples of intensive and extensive property. **05**
- OR
- C. Derive equation for air standard efficiency of diesel cycle. **05**

Q.2**Total: 10**

- A. State the Avogadro law and explain its importance. **05**
- B. Distinguish between gas and vapour. **05**

Q.2**Total: 10**

- A. What is a flywheel? What are its functions? **05**
- B. With a neat sketch describe open belt and cross belt drive. **05**

Q.3**Total: 10**

- A. What is priming? Why is it required for a centrifugal pump? **05**
- B. Classify the pumps, based on their principle of working construction of fluid flow direction in pump. **05**

OR

Q.3**Total: 10**

- A. Explain in details about working principal of hydraulic turbines. **05**
- B. Explain various types of solid fuels. **05**

SECTION-II

- Q.4** **Total: 15**
- A. A single stage air compressor compresses air through pressure ratio of 9 from a pressure of 1 bar. Free air delivery is $3 \text{ m}^3/\text{min}$. Swept volume and index of compression are 15 litres and 1.3 respectively. Determine i) power required in KW ii) rotational speed of the compressor in rpm. Neglect clearance. 05
- B. A Carnot engine working between 427°C and 47°C produces 135 KJ of work. Determine: Engine thermal efficiency and heat supplied. 05
- C. Enlist properties of aluminium. Also state its applications. 05
- OR
- C. Write short note on: Hot working and Cold working of Metals. 05
- Q.5** **Total: 10**
- A. What is dryness fraction? Explain throttling calorimeter. 05
- B. Why steam is superheated? Give the advantages and disadvantages of superheated steam. 05
- OR
- Q.5** **Total: 10**
- A. What is Boiler? Explain Classification of Boilers. 05
- B. Write short note on super heater. 05
- Q.6** **Total: 10**
- A. Explain with neat sketch vapour compression system. 05
- B. Explain with neat sketch Two stroke petrol engine. 05
- Q.6** **Total: 10**
- A. With neat sketch explain centrifugal compressor. 05
- B. Define the following : Absolute pressure, Gauge pressure, Atmospheric pressure. 05

KADI SARVA VISHWVIDHYALAYA**B.E. Semester: I/II [REGULAR]****Subject Code: CC 104-N****Subject Name: Fundamental of Mechanical Engineering****Date: 17/02/2022****Time: 12:30 P.M.-03:30 P.M.****Total Marks: 70**

Instructions:

1. Attempt all questions as directed and answer each section in separate main answer sheets.
2. Figures to the right indicate full marks.
3. Make suitable assumptions.
4. Indicate Clearly, the option you attempt along with its respective question number.
5. Use the last page of main supplementary for rough work.
6. Use of scientific calculator is permitted.
7. Please don't write anything on this question paper except your ID Number.
8. Please keep your Identity Cards and Hall Tickets on your desk during the examination.
9. Please follow all the instructions provided by authorized university and institute personnel.

SECTION - I**Q. 1****Total: 15**

- A. A Diesel engine has a compression ratio of 20 and cut-off takes place at 5% of the stroke. Find the air-standard efficiency. Assume $\gamma=1.4$ **05**
- B. The following reading were taken during the test of single cylinder four stroke oil engine: **05**
- 1) Cylinder diameter: 250mm
 - 2) Stroke length: 400mm
 - 3) Mean effective pressure: 6.5 bar
 - 4) Engine speed: 250 rpm
 - 5) Net load on the brake: 1080 N
 - 6) Effective diameter of the brake: 1.5m
 - 7) Fuels used per hour: 10 kg
 - 8) Calorific value of fuel: 44300 KJ/Kg
- Calculate: indicated power, brake power, Mechanical efficiency, and indicated thermal efficiency.

- C. Explain with neat sketch: open, close and isolated system. **05**

OR

- C. Write short note on modes of heat transfer. **05**

Q. 2**Total :10**

- A. Prove that $C_p - C_v = R$ with usual notation. **05**
- B. What is an air standard efficiency? State the assumption made in air standard efficiency? **05**

OR**Q. 2****Total :10**

- A. Differentiate between the functions of a governor and flywheel. **05**
- B. Write a short note on: types of belt drive. **05**

Q. 3**Total: 10**

- A. Write comparison between reciprocating and centrifugal pump. **05**
- B. Explain with a neat sketch: Vane pump **05**

OR

Q. 3

- A. Explain working principal of steam turbines.
B. What are the advantages and disadvantages of liquid fuels over solid fuels?

Total: 10

05

05

SECTION-II

Q. 4

- A. A single stage air compressor draws 2 m^3 of air/min at 1 bar absolute and compresses it according to the law $PV^{1.2} = \text{Constant}$ to the delivery pressure of 5 bar absolute. The compressor is driven by an electric motor having a power of 7.5 kW. Calculate the indicated power and the mechanical efficiency assuming no clearance.
B. 0.15 m^3 of air at a pressure of 900 kPa and 300°C is expanded at constant pressure to 3 times its initial volume. It is then expanded polytropically following the law $PV^{1.5} = C$ and finally compressed back to initial state isothermally. Calculate (1) Net heat received by the cycle (2) Net heat rejected by the cycle (3) Efficiency of the cycle.
C. Explain various mechanical properties of metals.

Total: 15

05

05

05

OR

- C. Classify engineering materials & metals.

05

Q. 5

- A. Explain the formation of steam at constant pressure with suitable sketches.
B. What is dryness fraction? Explain throttling calorimeter.

Total: 10

05

05

OR

Q. 5

- A. Explain with neat sketch the working of Babcock and Wilcox boiler.
B. Write a short note on economisers.

Total: 10

05

05

Q. 6

- A. Define refrigeration. Also write down the application of refrigeration.
B. Explain with neat sketch Four stroke petrol engine.

Total: 10

05

05

OR

Q. 6

- A. Derive equation for work done in single stage reciprocating compressor without clearance.
B. How prime movers are classified? What are different sources of energy used by them?

Total: 10

05

05