

**KADI SARVA VISHVAVIDHYALAYA**  
**B.E. SEM I/II (Regular/ATKT) (DECEMBER 2015)**

**Subject Code:CC-104**

**Subject Name: Elements of Mechanical Engineering**

**Date: 02/01/2016**

**Time: 10.30a.m.-1.30p.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) Explain with neat sketch : Constant volume process for Ideal gas. [5]

(B) Write short note : Constant pressure cycle for IC engine. [5]

(C) Explain with neat sketch : Lancashire boiler. [5]

**OR**

(C) Explain with neat sketch : Vapour absorption refrigeration system. [5]

**Q 2** (A) Define the following : [5]

(1) Latent heat (2) Sensible heat (3) Dryness fraction (4) Heat engine (5) Prime mover

(B) Explain with neat sketch (1) Boyle's Law (2) Charle's Law [5]

**OR**

**Q 2** (A) Explain with neat sketch (1) 1<sup>st</sup> Law of thermodynamics (2) 2<sup>nd</sup> Law of thermodynamics. [5]

(B) An oil engine works on diesel cycle with temperature of 25° C at the starting of compression. If the ratio of adiabatic compression is 16 and that of adiabatic expansion is 9. Find the efficiency of cycle . Take  $\gamma=1.4$  for air. [5]

**Q 3** (A) Write short note : Solid fuels. [5]

(B) The following data refers to a single cylinder 4 stroke petrol engine. Cylinder diameter = 25 cm , stroke of the piston = 40 cm , Engine speed = 1400 rpm , Indicated mean effective pressure = 4 bar , Fuel consumption = 20 liters per hour . Calorific value of the fuel = 45000 KJ/Kg . Specific gravity of the fuel=0.8 , Determine the Indicated thermal efficiency. [5]

**OR**

**Q 3** (A) Explain with neat sketch : Cochran boiler. [5]

(B) Write down classification of welding and give its application . [5]

## Section - II

- Q 4** (A) Write down classification of Air compressor and also mention use of compressed air. [5]  
(B) Write short note : Vapour compressor refrigeration system. [5]  
(C) Explain with neat sketch : Babcock and wilcox boiler. [5]

**OR**

- (C) Explain with neat sketch (1) Volute pump (2) Bucket pump [5]

- Q 5** (A) Define the following : [5]  
(1) Ductility (2) Elasticity (3) Creep (4) Brittleness (5) Plasticity  
(B) 5 Kg of Air is heated from  $25^{\circ}\text{C}$  to  $150^{\circ}\text{C}$ . Determine (1) Specific heat (2) Change in internal energy (3) Change in enthalpy (4) Heat supplied .Assume  $R=0.287 \text{ KJ/Kg K}$  and  $\gamma=1.4$  for air and work done 500 KJ.

**OR**

- Q 5** (A) Write down definition of Brazing process and give its application and limitations. [5]  
(B) Derive the equation  $Pv=mRT$  for perfect gas. [5]

- Q 6** (A) Write down comparison between Reciprocating and rotodynamic compressor. [5]  
(B) Explain in brief (1) Quality governing (2) Quantity governing [5]

**OR**

- Q 6** (A) Explain with neat sketch : Disc clutch [5]  
(B) Air enters the compressor at 0.2 Mpa and  $30^{\circ}\text{C}$  having volume of  $2 \text{ m}^3/\text{Kg}$  is compressed to 1 Mpa Isothermally. Calculate (1) Work done (2) Change in Internal energy (3) Heat transferred. [5]

# KADI SERVA VISHWAVIDYALAYA

## BE SEMESTER-II

### SUBJECT: ELEMENTS OF MECHANICAL ENGINEERING

Date: 27/05/2013

Time: 10:30 to 01:30

Max. Marks: 70

#### Instruction:

- (1) Answer each section in separate answer sheet.
- (2) Use of scientific calculator is permitted.
- (3) Use the last page of main supplementary of rough work.
- (4) Indicate clearly, the options you attempt with its respective question number
- (5) All questions are compulsory.

#### Section - I

##### Q.1

- [A] With usual notations prove that  $C_p - C_v = R$ . 5
- [B] Define the followings. 5
- |                                  |                 |
|----------------------------------|-----------------|
| 1. Prime Mover.                  | 2. Latent Heat. |
| 3. Specific Heat.                | 4. Open System. |
| 5. Zeroth law of thermodynamics. |                 |
- [C] 1. Write second law of thermodynamics (Both statement). 5
2. Prove dryness fraction + wetness fraction = 1.

#### OR

A gas whose pressure, volume, and temperature are 2.75 bar,  $0.09 \text{ m}^3$  and  $185^\circ\text{C}$ . The state changed at the constant pressure until its temperature become  $15^\circ\text{C}$ .

Calculate 1. Heat Transfer

2. Work done

Take  $R = 0.29 \text{ kJ/kg K}$ . And  $C_p = 1.005 \text{ kJ/kg K}$ .

##### Q.2

- [A] Explain the Throttling calorimeter. 5
- [B] Combined separating and throttling calorimeter is used to find out dryness fraction of steam. 5
- Following readings were taken:
- Main pressure = 12 bar.

Mass of water collected in separating calorimeter = 2 kg  
 Mass of steam condensed in throttling calorimeter = 20 kg  
 Temperature of steam after throttling =  $110^{\circ}\text{C}$ .  
 Pressure of steam after throttling = 1 bar (absou.)  
 Assume  $C_p$  of steam = 2.1 kJ/kg K  
 Calculate dryness fraction of steam.  
 Properties of steam At 1 bar  $T_{\text{sat}}=99.630\text{C}$ ,  $H_g=2675.4$  kJ/kg  
 At 12 Bar  $H_f=798.93$  kJ/kg,  $H_{fg}=1984.3$  kJ/kg.

### OR

#### **Q.2**

- |  |
|--|
| <b>[A]</b> Write the advantages and disadvantages liquid fuel over solid fuel. <span style="float: right;"><b>5</b></span><br><b>[B]</b> An ideal gas is heated from $25^{\circ}\text{C}$ to $145^{\circ}\text{C}$ . The mass of gas is 2 kg. Determine (i) Specific heats (ii) change in internal energy, (iii) change in enthalpy. Assume $R = 267$ J/kg K and $\gamma = 1.4$ for the gas. <span style="float: right;"><b>5</b></span> |
|--|

#### **Q.3**

- |  |
|--|
| <b>[A]</b> Explain and derive efficiency equation for Rankine cycle. <span style="float: right;"><b>5</b></span><br><b>[B]</b> In an ideal diesel cycle the temperature at beginning and at the end of Compression are $57^{\circ}\text{C}$ and $603^{\circ}\text{C}$ respectively. The temperatures at beginning and end of expansion are $1950^{\circ}\text{C}$ and $870^{\circ}\text{C}$ respectively. Determine the ideal efficiency of the cycle if pressure at beginning is 1.0 bar. Calculate: maximum pressure in the cycle. <span style="float: right;"><b>5</b></span> |
|--|

### OR

#### **Q.3**

- |  |
|--|
| <b>[A]</b> Give comparison between Petrol & Diesel engine. <span style="float: right;"><b>5</b></span><br>Also explain working of four stroke petrol engine.   |
| <b>[B]</b> The following results refer to a test on I.C. engine. <span style="float: right;"><b>5</b></span><br>Indicated Power = 42 kW<br>Frictional power = 7 kW<br>Engine speed = 1800 r.p.m.<br>Specific fuel consumption per B.P. = 0.30 kg/kWh<br>Calorific Value of fuel used = 43000 kJ/kg<br>Calculate: (i) Mechanical Efficiency (ii) Brake thermal efficiency (iii) Indicated thermal efficiency. |

## Section – II

**Q.4**

[A] Explain working principles of Vapour absorption refrigeration system. 5

[B] Give the name of all governors and explain any one of them. 5

[C] Explain Cochran boiler with neat sketch. 5

**OR**

[C] 1. Differentiate Fire tube and Water tube boiler. 5

2. Enlist different mountings. Explain any one with neat figure.

**Q.5**

[A] Explain with neat sketch the working of centrifugal pump. 5

[B] Give the comparison of axial flow compressor and centrifugal flow compressor. 5

**OR**

**Q.5**

[A] Explain with neat sketch the working of reciprocating pump. 5

[B] A single stage reciprocating air compressor is required to compress 1 kg of air from 1 bar to 5 bar. Initial temperature of air is 27 °C. Calculate work for isothermal, isentropic and polytrophic Compression for  $n= 1.25$ . 5

**OR**

**Q.6**

[A] Explain any five properties of engineering materials. 5

[B] Give the classification of brake and describe with neat sketch the working principle of an internal expanding shoe brake. 5

**OR**

**Q.6**

[A] Give the difference between soldering, brazing and welding. 5

[B] Give advantages of disadvantages of casting process. 5

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# KADI SARVA VISHWAVIDHYAAYA

B.E semester : I/II

Subject code : CC104

Subject name : Elements of Mechanical Engineering

Date: 26-12-2013

Time: 10 A.M to 1 P.M

Total marks :70

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## Instruction.

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

## Section-I

### Q.1 (All compulsory)

- (A) Explain Zeroth law ,first law and Second law of thermodynamics. (5)  
(B) Explain Carnot cycle. (5)  
(C) Derive the equation for Perfect gas , $PV = mRT$  (5)

**OR**

- (C) Explain the following (i) Specific heat capacity (ii) Higher calorific value (5)  
(iii) Lower calorific value.(iv) High Grade energy.

### Q.2 Answer the following questions.

- (A) Give the comparison between Four stroke engine and two stroke engine. (5)  
(B) Explain the following (i) Plunger pump and (ii) Bucket pump (5)

**OR**

- (A) Give the comparison between Reciprocation compressor and Rotodynamic compressor. (5)  
(B) A four cylinder two stroke cycle petrol engine develops 30 KW at 2500 rpm. The Indicated mean effective pressure of each is 800 Kpa and  $\eta_{mech} = 80\%$  . Calculate diameter and stroke of each of the cylinder if L/D = 1.5 , Also calculate the brake specific fuel consumption of the

engine if brake thermal efficiency is 28% . The calorific value of petrol is 44,000 KJ/Kg.

**Q.3 Answer the following questions.**

(A) Explain the vapour compression refrigeration system. (5)

(B) Explain Centrifugal compressor and Axial flow compressor with net sketch. (5)

**OR**

(A) Explain the following (i) Gear pump (ii) Vane pump (5)

(B) Explain four stroke CI engine with neat sketch. (5)

**Section II**

**Q.4 (All Compulsory)**

(A) Explain the following governing systems for IC engine (i) Heat and miss governing (5)

(ii) Quality governing

(B) Explain the following (i) Open belt drive (ii) Cross belt drive (5)

(C) Explain the following properties of materials (i) Strength (ii) Ductility (iii) Elasticity (5)

(iv) Fatigue (v) Brittleness

**OR**

(C) Define the following (i) Dryness fraction (ii) Sensible heat (iii) Latent heat (5)

(iv) Wetness fraction.

**Q.5 Answer the following questions.**

(A) Explain with neat sketch (i) Spur gear (ii) Helical gear (5)

(B) Explain CoCharan boiler with neat sketch. (5)

**OR**

(A) Give classification of welding processes and write up advantages and disadvantages (5)

Of welding process.

(B) In boiler test 1300 Kg of coal is consumed in 24 hours. The mass of water evaporated (5)

is 13000 Kg. Steam pressure is 7 bar. The feed water entering the boiler is  $40^{\circ}\text{C}$  . Calorific value of fuel is 30000 KJ/Kg. Dryness fraction of steam is 0.95 Calculate (i) Equivalent evaporation from and at  $100^{\circ}\text{C}$  . (ii) Boiler efficiency

Take  $C_{pw} = 4.187 \text{ KJ/Kg K}$  for water. At 7 bar pressure,  $h_f = 697.1 \text{ KJ/Kg}$ ,  $h_g = 2762 \text{ KJ/Kg}$

**Q.6 Answer the following questions.**

(A) State the name of various pattern used in foundry and explain any two patterns. (5)

(B) Explain the sand mould making procedure for metal casting. (5)

**OR**

(A) Explain Babcock Wilcox boiler with neat sketch. (5)

(B) Explain the following governors (i) Watt governor (ii) Porter governor (5)

# KADI SARVA VISHWAVIDYALAYA

## BE SEM-I

### SUBJECT: ELEMENTS OF MECHANICAL ENGINEERING

Date: 04-01-2013

max marks: 70

Time: 3hrs

Instructions: 1. Answer each section in separate answer sheet.

2. Use of scientific calculator is permitted

3. Assume suitable data if required

4. Use of steam table is permitted.

#### SECTION-1

**Q.1 EACH CARRIES EQUAL MARKS 15**

- [A] Define 1. Pressure 2. Work 3. Enthalpy 4. Specific heat 5. Statement of zeroth law
- [B] Explain adiabatic compression process with p-v diagram.
- [C] Explain calorific value

**OR**

- [C] Derive relationship between  $C_p$ ,  $C_v$  and R

**Q.2 10**

- [A] Explain rankine cycle with T-S diagram
- [B] Explain working of 4-stroke diesel engine

**OR**

**Q.2 10**

- [A] Derive work done equation for single acting reciprocating air compressor without clearance volume
- [B] Explain working of centrifugal pump with neat sketch

**Q.3 10**

- [A] Explain working of vapour compression refrigeration system
- [B] For a test on 4-stroke petrol engine following data is available:  
speed of engine 1000rpm, net brake torque 70Nm, indicated mean effective pressure 10bar, stroke 150mm, bore 100mm, rate of fuel consumption 2.57kg/hr, C.V. of petrol 41000KJ/kg. Calculate 1. Indicated thermal efficiency 2. Brake thermal efficiency and 3. Mechanical efficiency.

**OR**

**Q.3 10**

- [A] Explain working of roots blower air compressor.
- [B] Following observations were obtained during a test on a single cylinder oil engine: bore 300mm, stroke 450mm, speed 300mm, I.M.E.P. 6bar, net brake load 1.5KN, brake drum diameter 1.8m.  
**Calculate** 1. indicate power. 2. Brake power. 3. Mechanical efficiency.

**P.T.O.**

## SECTION-II

**Q.4**

**EACH CARRIES EQUAL MARKS**

**15**

- [A] Explain rope brake dynamometer
- [B] Explain working of watt governor with neat sketch.
- [C] List the different types of belt drive and explain compound belt drive.

**OR**

- [C] Explain working of single plate clutch with neat sketch.

**Q.5**

- [A] Classify the different types of engineering materials.
- [B] Write down the difference between welding brazing and soldering.

**OR**

**Q.5**

- [A] Write down the difference between hot and cold working process.
- [B] Define casting. List the different methods of casting and explain any one method of casting.

**10**

**Q.6**

- [A] Explain steam formation with T-H diagram
- [B] Explain working of Lancashire boiler with neat sketch.

**10**

**Q.6**

- [A] Explain working of throttling calorimeter with neat sketch.
- [B] Steam at 7bar, 250 °C and flowing through at the rate of 0.8 kg/s passes into a pipe carrying wet steam 0.95 dry at 7bar. After adiabatic mixing the flow rate is 2 kg/s. Determine the condition after mixing.

**10**

\*\*\*END OF PAPER\*\*\*

**KADI SARVA VISHVAVIDHYALAYA**  
**B.E. SEM I/II(Reg/ATKT) (DECEMBER 2014)**

**Subject Code:CC-104      Subject Name: Elements of Mechanical Engineering**

**Date: 01/01/2015      Time: 10.30a.m.-1.30p.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) Explain Zeroth law and Second law of thermodynamics. [5]  
(B) Write short note : Solid fuels. [5]  
(C) Define (1)Elasticity (2)Plasticity (3) Toughness (4) Ductility (5) Hardness [5]

**OR**

- (C) Explain with net sketch (1) open belt drive (2) Cross belt drive. [5]  
**Q 2** (A) Explain with net sketch (1) Combined gas law (2) Charle's law. [5]  
(B) Write short note: Cochran Boiler. [5]

**OR**

- Q 2** (A) Explain with net sketch (1) Lancashire Boiler [5]  
(B) A six cylinder 4-stroke cycle petrol engine is to develop 100 Kw Indicated power at 800 R.P.M . The stroke to bore ratio is 1.25 . Assume mechanical efficiency is 80% and brake mean effective pressure of 5 bar. Find out the diameter and stroke of the engine. [5]

- Q 3** (A) Explain with net sketch : Carnot cycle . [5]  
(B) Explain with neat sketch: Working of 4 stroke SI engine [5]

**OR**

- Q 3** (A) Write short note : Air standard Otto cycle [5]  
(B) Explain with neat sketch: Economizer. [5]

## Section - II

- Q 4** (A) Give the classification of boilers in short . [5]  
(B) Give comparison between Two stroke and four stroke cycle. [5]  
(C) Derive Characteristics equation of a perfect Gas which is  $PV=mRT$ . [5]
- OR**
- (C) Explain with neat sketch: (1) Hit and miss governing for Gas engine. [5]

- Q 5** (A) Write short note : (1) Bucket pump (2) Screw pump. [5]  
(B) Explain the types of chains used for power transmission. [5]

**OR**

- Q 5** (A) Explain with net sketch : Vapor absorption refrigeration system.. [5]  
(B) Give comparison between Reciprocating and Rotary compressor. [5]

- Q 6** (A) Give brief classification of welding and write down advantages and Disadvantages of welding. [5]  
(B) Explain in brief : Vapour compression Refrigeration System [5]

**OR**

- Q 6** (A) Write short note (1) Sleeve coupling (2) Bushed pin type coupling . [5]  
(B) Write short note (1) Internal expanding shoe brake (2) Single block brake [5]

----ALL THE BEST----

**KADI SARVA VISHVAVIDHYALAYA**  
**B.E. SEM I/II (Regular/ATKT) (MAY 2015)**

**Subject Code:CC-104**

**Subject Name: Elements of Mechanical Engineering**

**Date: 29/05/2015**

**Time: 10.30a.m.-1.30p.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 short note : Liquid fuels. [5]  
 (B) Explain with neat sketch : Watt Governor. [5]  
 (C)  $0.5 \text{ m}^3$  of air at pressure 1 bar is compressed at constant temperature until its volume is  $0.2 \text{ m}^3$ . What is then its pressure ? The air is then heated under constant pressure until its temperature is  $75^\circ \text{C}$  . Determine its volume and mass . Assume compression takes place at  $20^\circ \text{C}$  and  $R = 287 \text{ J/kg K}$ .

**OR**

- (C) Explain with neat sketch : Polytropic process for Perfect gas. [5]  
**Q 2** (A) For diesel engine cycle draw PV diagram and prove that [5]

$$\eta = 1 - \frac{1}{r^{\gamma-1}} \left[ \frac{p^{\gamma}-1}{\gamma(p-1)} \right]$$

- (B) For IC engine Explain with neat sketch : (1) Quantity governing (2) Hit and miss governing. [5]

**OR**

- Q 2** (A) Explain with neat sketch : (1) plunger pump (2) Bucket pump. [5]  
 (B) The following reading were taken during the test of single cylinder 4 stroke oil engine , [5]

Cylinder diameter = 250 mm , Stroke length = 400 mm , Mean effective pressure = 6.5 bar , Engine speed = 250 rpm , Net load on the brake = 1080 N , Effective diameter of the brake = 1.5 m , Fuel used per hour = 10 kg , calorific value of fuel = 44300 kJ/Kg . Calculate the Indicated power, brake power , Mechanical efficiency , Indicated thermal efficiency.

- Q 3** (A) Explain with statement : 1<sup>st</sup> law and 2<sup>nd</sup> law of thermodynamics. [5]  
 (B) Explain with neat sketch : Adiabatic process for perfect gas [5]

**OR**

- Q 3** (A) Write short note : Babcock and Wilcox boiler. [5]  
 (B) Define the following : (1) Sensible heat (2) Latent heat (3) Dry ness fraction [5]  
 (4) High grade energy (5) Intensive property

## Section - II

- Q 4** (A) Explain with neat sketch : Carnot cycle. [5]  
(B) Write short note : 4 stroke diesel engine cycle. [5]  
(C) Explain with neat sketch : vapour compression refrigeration system. [5]

**OR**

- (C) Explain with neat sketch : Lancashire boiler. [5]

- Q 5** (A) Explain with neat sketch : Centrifugal pump. [5]  
(B) Define the following : (1) Elasticity (2) Fatigue (3) Malleability (4) Stiffness  
(5) Brittleness [5]

**OR**

- Q 5** (A) Write down the classification of forging and explain any one type of forging. [5]  
(B) Give the definition of refrigeration . Write down the application of refrigeration and also mention the properties of good refrigerant. [5]

- Q 6** (A) Explain with neat sketch : (1) open belt drive (2) Cross belt drive [5]  
(B) Write short note : White cast Iron [5]

**OR**

- Q 6** (A) Explain with neat sketch : Boyle's and charle's law. [5]  
(B) Explain with neat sketch : Economizer. [5]

----ALL THE BEST----