R09

Code No: 54015

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, May - 2019
APPLIED THERMODYNAMICS – I
(Common to ME, AME)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
- - -

1.a) Explain with the help of p-v diagram the loss due to variation of specific heats in Otto cycle.
b) Compare and contrast the actual cycles and fuel-air cycles of S.I Engine in detail. [8+7]

2. Illustrate the constructional details of an I.C engines. Explain briefly about the important components and its materials. [15]

3.a) What is abnormal combustion in S.I. Engine? Compare the abnormal combustion with normal combustion in detail.
b) Explain the desirable characteristics of a good combustion chamber for S.I. Engine in detail. [7+8]

4.a) What are different stages of combustion in C.I. Engine? Explain with p-θ diagram.
b) Describe the phenomenon of knocking in C.I. Engine and how it is different from S.I. Engine detonation. [7+8]

5.a) The following data was recorded during testing of a four stroke cycle gas engine. Area of indicator diagram = 900 mm^2; Length of indicator diagram = 70 mm; spring scale = 0.3 bar/mm; Diameter of piston = 200 mm; Length of stroke = 250 mm; Speed = 300 rpm. Determine:
i) Indicated mean effective pressure
ii) Indicated power.
b) A twin-cylinder two-stroke engine has a swept volume of 150 cm^3. The maximum power output is 19 kW at 11000 rpm, bsfc is 0.11 kg/MJ and the air/fuel ratio is 12. If ambient test conditions were 10^0C and 1.03 bar and the fuel has a calorific value of 44 MJ/kg, calculate the BMEP, overall efficiency and the volumetric efficience. [7+8]

6.a) Derive the equation for work required for a single stage reciprocating air compressor.
b) Differentiate between positive displacement compressors and roto dynamic machines in detail. [7+8]

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7.a) What are different losses occurring in the centrifugal compressor due to different blade shapes? Explain.

b) Define and explain the terms pressure coefficient and adiabatic coefficient of a centrifugal compressor. [8+7]

8.a) Differentiate between centrifugal compressor with the axial flow compressor in detail.

b) What is the type of compressor applicable for aircraft application? Explain its working principle in detail. [7+8]

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Code No: 114DU **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, December - 2018
THERMAL ENGINEERING – I
(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) What is gas power cycle? [2]
b) Define mixture strength. [3]
c) What is the function of a governor in I.C Engines? [2]
d) Define cetane number. [3]
e) Define the terms compression ratio and cutoff ratio. [2]
f) What is scavenging in IC engines? [3]
g) What are the various types of compressors? [2]
h) Define degree of reaction. [3]
i) Define: COP. [2]
j) What is net refrigerating effect of a refrigerant? [3]

PART-B

(50 Marks)

2. Explain with a neat sketch the working principle of a four stroke engine with a line sketch. [10]

OR

3. What is the need of a cooling system in an automobile engine? Explain the general type of cooling system used in four wheeled vehicles. [10]

4. What do you mean by pre ignition? How can it be detected? [10]

OR

5. What is meant by ignition delay? Explain the causes of knock in C.I. Engines. [10]

6. Explain the method used for the measurement of indicated power of multi cylinder engine. [10]

OR

7. Find out the expression for the work saved per kg of air in a three stage compressor, if the perfect inter cooling is used during the compression process. [10]

8. Explain the working of Roots blower with a line diagram and find the expression for its efficiency. [10]

OR

9. Explain with a line sketch the working principle of centrifugal compressor. [10]

JNTUH USED 15-12-2018 AM

10. Explain the construction and working of vapour absorption refrigeration system. [10]

OR

11. A simple saturation refrigeration cycle developing 15 tons of refrigeration using R12 operates with a condensing temperature of 35^0C and an evaporator temperature of - 6^0C. Calculate: (a) The refrigerating effect, (b) Refrigerant flow rate (c) The power required to drive the compressor, (d) COP. [10]

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JNTUH USED 15-12-2018AM

Code No: 114DU **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, April - 2018
THERMAL ENGINEERING – I
(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) Name the processes and piston displacement in 4 stroke petrol engine. [2]
b) What are the advantages of liquid cooling system? [3]
c) Define abnormal combustion. [2]
d) What is cetane and octane number? [3]
e) Define specific fuel consumption and supercharging. [2]
f) Write the effects of engine overheating and engine under cooling. [3]
g) Define slip and slip factor and pressure coefficient. [2]
h) Write the losses in axial flow compressor. [3]
i) What is the difference between refrigerator and a heat pump? [2]
j) What is ozone depletion and global warming? [3]

PART-B

(50 Marks)

2.a) What are the desirable properties of lubricating oil?
b) Compare Spark Ignition Engines with Compression Ignition Engines. [5+5]

OR

3.a) What is firing order? Which one is most preferred?
b) Explain the battery ignition system with a neat sketch. [4+6]

4.a) Bring out clearly the process of combustion in CI engines.
b) Explain the various stages of combustion in SI engines. [5+5]

OR

5.a) Explain the phenomenon of knock in CI engines and compare it with SI engine knock.
b) Explain the various factors that influence the flame speed. [6+4]

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6. A full load test was conducted on a 2 stroke engine and the following results were obtained:
Speed = 500 rpm
Brake load = 500N
imep = 3 bar
Oil consumption = 5kg/h
Jacket water temperature rise =35^0C
Jacket water flow rate = 7 kg/min
A/F ratio by mass = 30
Exhaust gas temperature = 350^0 C
Room temperature = 25^0 C
Atmospheric pressure = 1 bar
Cylinder diameter = 22 cm
Stroke = 28 cm
Brake diameter = 1.6 m
CV of fuels = 42000 kJ/kg
Proportion of H_2 by mass in fuel = 15%
Specific heat of exhaust gas = 1.0 kJ/kgK
Specific heat of dry stream = 2.0kJ/kgK
Calculate:
a) Indicated thermal efficiency
b) Specific fuel consumption
c) Volumetric efficiency based on atmospheric conditions
Draw up a heat balance sheet for test. [10]

OR

7. A three-stage, double acting, reciprocating air compressor operating at 300 rpm, receives air at 1bar and 27^0C. The bore of LP cylinder is 360 mm and its stroke is 400 mm. Intermediate cylinder and HP cylinder have same stroke as LP cylinder. The clearance volume in each cylinder is 4% of the stroke volume. The LP cylinder discharges air at a pressure of 5 bar, the intermediate cylinder discharges at 20 bar and air is finally discharged by the HP cylinder at 75 bar. The air is cooled in intercoolers to initial temperature after each stage of compression. A pressure drop of 0.2 bar takes place in intercooler after each stage. The index of compression and expansion for an LP cylinder is 1.3, for intermediate cylinder is 1.32 and for HP cylinder is 1.35. Neglect the effect of piston rod and assume C_p=1.005 kJ/kgK, and R= 0.287kJ/kgK. Calculate a)Heat rejected in each stages in intercooler and during compression, b) Heat rejected in after cooler, if delivered air is cooled to initial temperature, c) Diameter of intermediate and HP cylinders, d) Power required to drive compressor, if its mechanical efficiency is 85%. [10]

8.a) Describe the principle of operation, construction and working of centrifugal compressor.
b) Explain the phenomena of surging and its effects in the centrifugal compressor. [6+4]

OR

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9.a) Derive an expression for indicated work of a reciprocating air compressor by neglecting clearance.

b) A single-stage, single acting reciprocating air compressor has a bore of 20 cm and a stroke of 30 cm. The compressor runs at 600 rpm. The clearance volume is 4% of the swept volume and index of expansion and compression is 1.3. The suction conditions are at 0.97 bar and 27^0C and delivery pressure is 5.6 bar. The atm conditions are at 1.01 bar and 17^0C. Determine:
i) The free air delivered in m^3/min,
ii) The volumetric efficiency referred to the free air conditions,
iii) The indicated power. [5+5]

10.a) With the help of a P-h diagram, discuss the effects of sub cooling and superheating on the performance of standard vapour compression system.

b) What is Air refrigeration system? Where it is used and why? [6+4]

OR

11. A refrigerator operates between temperature limits of 30^0C and -5^0C. The refrigerant is 0.97 dry before leaving the evaporator coil. Find the condition of refrigerant entering the evaporator and cop of system. If the temperature rise of water circulating through the condenser is limited to 20^0C, calculate mass flow rate of the coolant.
Use properties of refrigerant from table given below:

Temp-^{o}C	Enthalpy kJ/kg		Entropy kJ/kg.K		Specific heat kJ/kg.K	
	h_f	h_g	s_f	s_g	$C_{p,L}$	$C_{p,g}$
30	323.22	1465.38	1.2037	4.9839	5.024	3.35
-5	158.26	1431.89	0.63	5.4072	--	--

Take C_p for superheated vapour as 3.35kJ/kgK. [10]

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Code No: 124DU **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year II Semester Examinations, April/May - 2023
THERMAL ENGINEERING - I
(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

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PART - A

(25 Marks)

1.a)	Why cooling of an internal combustion engine is necessary?	[2]
b)	Draw the valve timing diagram of CI engine	[3]
c)	What is meant by delay period?	[2]
d)	What is meant by abnormal combustion?	[3]
e)	Write the classification of Air Compressors.	[2]
f)	Define Indicated power and Brake power.	[3]
g)	Write the advantages of Roots Blower over other compressors.	[2]
h)	Define Slip Factor.	[3]
i)	What are the units of Refrigeration, Define it?	[2]
j)	Write the effect of sub cooling on the COP of Refrigeration.	[3]

PART - B

(50 Marks)

2. Draw the Valve timing Diagram of 4-Stroke Diesel engine. Explain all points in detail. [10]

OR

3. With the help of a neat sketches, explain Forced circulation cooling system. [10]

4. Explain with figures the various types of combustion chambers used in CI engines. [10]

OR

5.a) What are the requirements of Diesel fuel?
b) Write about Knocking and Detonation. [5+5]

6. A single cylinder engine running at 1800 rpm develops a torque of 8 Nm. The indicated power of the engine is 1.8 kW. Find the loss due to friction power as the percentage of brake power? [10]

OR

7. Explain the working principle of a Reciprocating Air Compressor with line diagram. [10]

8. Draw the line diagram of Roots Blower compressor, and explain its working. [10]

OR

9. Draw the line diagram of Centrifugal compressor, and explain its working. [10]

10. Explain the working of Vapor compression refrigeration system with line diagram. [10]

OR

11. Explain the working of Lithium Bromide refrigeration system with line diagram. [10]

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JNTUH Used papers 2023

Code No: 154CD **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, July/August - 2021
THERMAL ENGINEERING – I
(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) How does the fuel injection system creates switch in the compression ignition engine? Explain.
b) Differentiate between magnetic ignition system and electric ignition system. [8+7]

2.a) What are the various types of combustion chambers used in SI engines? Explain them briefly.
b) The lubrication is necessary in internal combustion system? Why. [8+7]

3.a) What is delay period and discuss the factors that affect the delay period.
b) What is the role of anti knocking agents in internal combustion engine? Explain the anti knocking agents used in CI and SI engines. [7+8]

4. Why Morse test is not suitable for single cylinder engine? Describe the method of finding friction power using Morse test. [15]

5.a) A single acting compressor has a bore and stroke of 10 cm and is driven at 350 rpm. The clearance volume is 75 cm^2 and the index of compression and expansion is 1.23. The suction pressure is 0.95 bar and the delivery is 7 bar. Calculate the volume of free air at 1:01335 bar and 20^0C dealt with per minute and power required to compute the air.
b) A four stroke SI engine has the cylinder dimensions of 100mm and 120mm bore and stroke respectively. If the engine is operated at 1500rpm has a mean effective pressure 4.25 bar, then calculate indicated power and indicated thermal efficiency if mean of fuel is 0.02 kg/s and CV of 43000kJ/kg. [7+8]

6.a) With the help of a neat sketches explain the working of centrifugal air compressor clearly discussing how the pressure changes take place in impeller and diffuser.
b) Draw the schematic diagram vane compressor and explain working. [8+7]

7.a) Differentiate between positive displacement type compressors and dynamic compressors.
b) Derive the equation for the estimation of optimum pressure ratio of a gas turbines for the maximum network output. [7+8]

8.a) Draw the schematic diagram of gas turbine cycle with a regenerator and derive the equation for thermal efficiency.
b) A gas turbine is designed to generate the power capacity of 20mW. The air enters the compressor at 1.01325 bar and 25^0C and compressor to a pressure 8.5 bar and heater to a maximum temp of 1400^0C. Then calculate i) Work ratio ii) Back work ratio iii) Efficiency iv) mean flow rate of air. [7+8]

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R09

Code No: 54015

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year II Semester Examinations, December - 2017
APPLIED THERMODYNAMICS-I
(Common to ME, AME)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
- - -

1.a) Discuss the effect of specific heat and composition of cylinder gases on the performance of an IC engine?
b) The air fuel ratio of a diesel engines is 31:1. If the compression ratio is 15:1 and the temperature at the end of the compression is 1000 K, find at what percentage of stroke is the combustion complete is the combustion complete, if the combustion begins at TDC and continuous at constant pressure. Calorific value of the fuel is 40000kJ/kg. Assume the variable specific heat, $C_p = a + bT$, where a = 1 and b = 0.28×10^{-4}. [6+9]

2.a) With neat sketch describe different components of a Carburetor used in Spark Ignition Engines.
b) Classify types of Lubrication Systems? Explain Pressure Feed lubrication systems with a neat sketch. [7+8]

3.a) Explain with neat sketch different stages of combustion in Spark Ignition engines.
b) Discuss different types of combustion chambers used for SI Engines. [7+8]

4.a) Explain the effect of turbulence on combustion in CI engines.
b) Describe in detail about important qualities of Compression Ignition Engine Fuels. [7+8]

5. The air flow to a four cylinder four stroke oil engine is measured by means of a 5 cm diameter orifice having a coefficient of discharge of 0.6. During a test on the engine, the following data were recorded; Bore = 10 cm, stroke = 12 cm, speed = 1200rpm, BP = 120N-m, fuel consumption = 5kg/hr, CV of fuel = 42MJ/kg, pressure drop across orifice is 4. 6 cm of water, ambient temperature and pressure are 17^0C and 1 bar respectively. Calculate (a) $\eta_{bth,}$ (b) BMEP and (c) $\eta_{vol,}$ based free air condition. [15]

6. A single stage, double acting air compressor delivers 15 m^3 of free air per minute from 1 bar to 8 bar at 300 rpm. Assuming compression and expansion follow $PV^{1.3}$ = C and clearance is $1/16^{th}$ of swept volume, find the diameter and the stroke of the compressor if L/D = 1.5. Take the temperature and the pressure at the suction as same as that of atmospheric air. [15]

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7.a) Classify different types of positive displacement compressors? Explain with sketch rotary vane compressors.

b) A centrifugal delivers 580 m^3 of free air when running at 800 rpm. Using the following data:
Inlet pressure and temperature = 1.013 bar and 20^0C
Compression ratio = 3.5
Isentropic efficiency = 83%
Flow velocity throughout the impeller = 62 m/ sec
Blade area coefficient = 0.94.
The blades are radial at the outlet of the impeller and Tip diameter = 2 × eye diameter. Find,
(i) the IP required to run the compressor, (ii) impeller diameter at inlet and outlet and (iii) impeller blade angle at inlet. [6+9]

8. Air at 1 bar and 288K enters an axial flow compressor stage with an axial velocity of 150 m/s. There are no inlet guide vanes. The rotor has a tip diameter of 60 cm and a hub diameter of 50 cm and rotates at 100 rps. The air enters the rotor and leaves the stator with no change in velocity or radius. The air is turned through 30^0 as it passes through the rotor. Determine (a) the blade angles (b) mass flow rate (c) power required and (d) the degree of reaction. [15]

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Code No: 114DU **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year II Semester Examinations, August/September - 2022
THERMAL ENGINEERING - I
(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
- - -

1. What is the need of a cooling system in IC Engines? Explain air cooling system with neat sketch. [15]

2. What is solid injection system? Explain the working of a jerk pump. [15]

3. Discuss the important qualities of CI and SI engine fuels. [15]

4.a) Why flame speed is important for complete combustion? How it is controlled?
b) What is delay period and what are the factors that affect it? [8+7]

5. In a test of an oil engine under full load condition the following results were obtained.
Indicated Power = 33 kW
Brake Power = 27 kW
Fuel Consumption = 8 kg/h
Rate of flow of water =12 kg/min
Cooling water flow rate = 7 kg/min
Calorific value of fuel = 43 MJ/kg
Inlet temperature of cooling water = 15^0C
Outlet temperature of cooling water = 75^0C
Inlet temperature of water to exhaust gas calorimeter = 15^0 C
Outlet temperature of water to exhaust gas calorimeter = 55^0C
Final temperature of the exhaust gases = 80^oC
Room temperature = 17^0C
A/F ratio on mass basis = 20
Mean specific heat exhaust gas = 1 kJ/kgK
Specific heat of water = 4.18J/kgK
Draw up a heat balance sheet and estimate the thermal and mechanical efficiencies.[15]

6.a) Briefly discuss the various efficiency terms associated with an engine.
b) Explain the effect of the following factors on the performance of an SI engine:
i) Compression ratio ii) air-fuel ratio iii) spark timing iv) engine speed v) mass of inducted charge and vi) heat losses. [7+8]

7.a) Compare the reciprocating and rotary compressors. Give their practical applications.
b) Describe the principle of operation, construction and working of vane type compressor. [7+8]

8. Discuss the Bell-Coleman cycle for gas refrigeration with the help of schematic, T-S and p-v diagrams. Explain the effect of pressure ratio on the performance of the cycle. [15]

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JNTUH Used paper Aug-2022