Code No: 124DU

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, May - 2017
THERMAL ENGINEERING – I
(Common to ME, AME)

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 are the different strokes in two stroke engines.	[2]
b)	List out the differences between the SI engine and CI engine.	[3]
c)	What is meant by Cetane number?	[2]
d)	Describe the three desirable properties of CI engine fuels.	[3]
e)	What is the importance for measurement of exhaust gas temperature?	[2]
f)	List out the functions of compressors.	[3]
g)	On which principle the centrifugal pump works.	[2]
h)	Explain the importance of slip factor in compressor.	[3]
i)	What is meant by tonne of refrigeration?	[2]
j)	List out the advantages of air refrigeration.	[3]

PART-B

(50 Marks)

2.a) How does the Zenith carburetor fulfill the requirements of a good carburetor.
b) Explain the working of battery ignition system with the neat sketch. [5+5]

OR

3.a) Explain the working of solid injection system with neat sketch.
b) Explain the working of splash lubricating system with neat sketch. [5+5]

4.a) Briefly explain the stages of combustion in SI engines elaborating the flame front propagation.
b) Explain the effect of various engine variables on SI engine knock. [5+5]

OR

5.a) What are the methods to be followed to avoid knocking in SI engine.
b) What are anti knock agents? Indicate the substances used and their effects on reducing of knocking. [5+5]

6. During a test on a diesel engine the following observations were made:
The power developed by the engine is used for driving a D.C. generator. The output of the generator was 210 A at 200V; the efficiency of generator being 82%.The quantity of fuel supplied to the engine was 11.2 kg/h; calorific value of fuel being 42600kJ/kg. The air-fuel ratio was 18:1. The exhaust gases were passed through a exhaust gas calorimeter for which the observations were as follows:
Water circulated through exhaust gas calorimeter = 580 liters/hr. Temperature rise of water through calorimeter=36^{0}C. Temperature of exhaust gases at exit from calorimeter=98^{0}C. Ambient temperature=20^{0}C.
Heat lost to jacket cooling water is 32% of the total heat supplied.
If the specific heat of exhaust gases be 1.05kJ/kg K. Draw up the heat balance sheet on minute basis. [10]

OR

7.a) Explain the air box method for the measurement of air consumption in internal combustion engine.

b) A six cylinder, 4 stroke SI engine having a piston displacement of 700cm^3 per cylinder developed 78kW at 3200r.p.m. and consumed 27 kg of petrol per hour. The calorific value of petrol is 44 MJ/kg. Estimate:
i) The volumetric efficiency of the engine if the air-fuel ratio is 12 and intake air is at 0.9 bar, 32^{0}C ii) The brake thermal efficiency iii) The brake torque
For air, R=0.287kJ/kg K. [5+5]

8. A centrifugal compressor running at 8000 rpm delivers 660m^3/min of free air. The air is compressed from 1.01 bar and 15^{0}C to a pressure of 3 with an isentropic efficiency of 80%. Blades are radial at outlet of impeller and flow velocity of 60 m/s may be assume throughout constant. The outer radius of impeller is thrice the inner and the slip factor may be assumed as 0.8.The blade area coefficient may be assumed 0.8 at inlet. Calculate:
a) Final temperature of air b) Theoretical power c) Impeller diameters at inlet and outlet d) Breadth of impeller at inlet e) Impeller blade angle at inlet f) Diffuser blade angle at inlet. [10]

OR

9.a) Explain the working of roots blower compressor with neat sketch.

b) A centrifugal compressor delivers 50 kg of air per minute at a pressure of 2 bar and 97^0 C. The intake pressure and temperature of air is 1 bar and 15^{0}C. If no heat is lost to the surrounding, find: i) index of compression ii) Power required, if the compression is isothermal, Take R=287/kg K. [5+5]

10.a) Explain the working of Vapour compression refrigeration system with a neat diagram.

b) A Carnot cycle machine operates between the temperature limits of 47^{0}C and -30^{0}C. Determine the COP when it operates as i) refrigerating machine ii) A heat pump iii) A heat engine. [5+5]

OR

11.a) Explain the working of vapour absorption system with neat sketch.

b) A Bell-Coleman refrigerator works between 4 bar and 1 bar pressure limits. After compression, the cooling water reduces the air temperature to 17^{0}C. What is the lowest temperature produced by the ideal machine?
Compare the coefficient of performance of this machine with that of the ideal Carnot cycle machine working between the same pressure limits, the temperature at the beginning of compression being -13^0 C. [5+5]

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