Code No:RR220303 | RR | SET-1

B.Tech II Year - II Semester Examinations, April/May-2012
THERMAL ENGINEERING - I
(MECHANICAL ENGINEERING)

Time: 3 hours **Max. Marks: 80**

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

1.a) How do you classify the I C Engines based on governing mechanism, number of strokes and number of cylinders? Explain them.
b) Draw the battery ignition system and explain the important points. [16]

2.a) What are different major losses involved in S I Engine in comparison with the air standard cycle and draw the actual cycle? Explain.
b) What are different factors influencing the ignition lag of S I Engine? Explain them in detail. [16]

3.a) What is diesel knock? What are the favorable conditions for knocking in C I Engines? How to control knocking?
b) Draw the schematic diagram of divided combustion chamber and explain its working. [16]

4.a) What are the good requirements for diesel fuel and explain the importance of fuel rating?
b) Draw the actual and ideal P-θ diagram and explain different stages of combustion in S I Engine. [16]

5.a) How to measure the frictional power in I C Engine using retardation test? Explain.
b) A power output (in kW) of six cylinder four stroke engine is absorbed by hydraulic dynamometer for which the law WN/20000, where W is Newton and the N is speed in rpm. The air consumption is measured by air box method. The following readings were obtained: orifice of diameter = 30 mm, stroke = 120mm, Bore = 100 mm, Brake load = 560 N, C/H ratio by mass 85/15, C_d of orifice = 0.6, Ambient pressure = 1 bar, Pressure drop across the orifice = 14.5 cm of Hg. Time taken for 100 cc fuel consumption = 20 sec. Ambient temperature = 27^0C, Fuel density = 835 kg/m^3. N= 2400.
Calculate
i) Brake power ii) Torque iii) BSFC
iv) Percentage of excess air supplied v) Volumetric efficiency. [16]

6.a) Derive the equation for the optimum pressure ratio for two stage compression with perfect inter cooling and extend it for n number of cylinders.
b) A single stage double acting air compressor of 62.5 kW I.P. running at 120 rpm takes air at 1 bar and delivers at 10 bar. Assuming the law of expansion and compression as $pv^{1.35}$ = constant, find the diameter and stroke of the cylinder if the stroke to bore ratio is 1.25. [16]

7.a) Differentiate between positive displacement compressors and dynamic compressors.

b) A centrifugal air compressor delivers 15 kg of air, per minute. The inlet and outlet conditions of air are V_1 = 10 m/s, p_1 = 1 bar, v_{s1} = 0.5 m^3/kg, and V_2 = 80 m/s, p_2 = 7 bar, v_{s2} = 0.15 m^3/kg. The increase in enthalpy of air passing through the compressor is 160 kJ/kg and heat loss to the surroundings is 720 KJ/min. Find the power required to drive the compressor. Assume that inlet and discharge lines are at the same level. [16]

8.a) A refrigerating unit is working between 40^0C and -10^0C. The load on the unit is 5 tons. Find:

i) COP of the system;

ii) Power required to run system.

Assume that the refrigerant is dry and saturated vapour leaving the evaporator and compression is isentropic. The refrigerant used is NH_3.

If the temperature of the refrigerant required in the evaporator is -20^0C, then, find the change in COP of the system and the power required.

b) Draw the layout of summer air conditioning system and explain its working principle along with psychrometric chart. [16]

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Code No:RR220303 | RR | SET-2

B.Tech II Year - II Semester Examinations, April/May-2012
THERMAL ENGINEERING - I
(MECHANICAL ENGINEERING)

Time: 3 hours **Max. Marks: 80**

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

1.a) What is diesel knock? What are the favorable conditions for knocking in C I Engines? How to control knocking?
b) Draw the schematic diagram of divided combustion chamber and explain its working. [16]

2.a) What are the good requirements for diesel fuel and explain the importance of fuel rating?
b) Draw the actual and ideal P-θ diagram and explain different stages of combustion in S I Engine. [16]

3.a) How to measure the frictional power in I C Engine using retardation test? Explain.
b) A power output (in kW) of six cylinder four stroke engine is absorbed by hydraulic dynamometer for which the law WN/20000, where W is Newton and the N is speed in rpm. The air consumption is measured by air box method. The following readings were obtained: orifice of diameter = 30 mm, stroke = 120mm, Bore = 100 mm, Brake load = 560 N, C/H ratio by mass 85/15, C_d of orifice = 0.6, Ambient pressure = 1 bar, Pressure drop across the orifice = 14.5 cm of Hg. Time taken for 100 cc fuel consumption = 20 sec. Ambient temperature = 27^0C, Fuel density = 835 kg/m^3. N= 2400.
Calculate
i) Brake power ii) Torque iii) BSFC
iv) Percentage of excess air supplied v) Volumetric efficiency. [16]

4.a) Derive the equation for the optimum pressure ratio for two stage compression with perfect inter cooling and extend it for n number of cylinders.
b) A single stage double acting air compressor of 62.5 kW I.P. running at 120 rpm takes air at 1 bar and delivers at 10 bar. Assuming the law of expansion and compression as $pv^{1.35}$ = constant, find the diameter and stroke of the cylinder if the stroke to bore ratio is 1.25. [16]

5.a) Differentiate between positive displacement compressors and dynamic compressors.
b) A centrifugal air compressor delivers 15 kg of air, per minute. The inlet and outlet conditions of air are V_1 = 10 m/s, p_1 = 1 bar, v_{s1} = 0.5 m^3/kg, and V_2 = 80 m/s, p_2 = 7 bar, v_{s2} = 0.15 m^3/kg. The increase in enthalpy of air passing through the compressor is 160 kJ/kg and heat loss to the surroundings is 720 KJ/min. Find the power required to drive the compressor. Assume that inlet and discharge lines are at the same level. [16]

6.a) A refrigerating unit is working between 40^0C and -10^0C. The load on the unit is 5 tons. Find:
i) COP of the system;
ii) Power required to run system.
Assume that the refrigerant is dry and saturated vapour leaving the evaporator and compression is isentropic. The refrigerant used is NH_3.
If the temperature of the refrigerant required in the evaporator is -20^0C, then, find the change in COP of the system and the power required.

b) Draw the layout of summer air conditioning system and explain its working principle along with psychrometric chart. [16]

7.a) How do you classify the I C Engines based on governing mechanism, number of strokes and number of cylinders? Explain them.

b) Draw the battery ignition system and explain the important points. [16]

8.a) What are different major losses involved in S I Engine in comparison with the air standard cycle and draw the actual cycle? Explain.

b) What are different factors influencing the ignition lag of S I Engine? Explain them in detail. [16]

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Code No:RR220303 | RR | SET-3

B.Tech II Year - II Semester Examinations, April/May-2012
THERMAL ENGINEERING - I
(MECHANICAL ENGINEERING)

Time: 3 hours **Max. Marks: 80**

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

1.a) How to measure the frictional power in I C Engine using retardation test? Explain.

b) A power output (in kW) of six cylinder four stroke engine is absorbed by hydraulic dynamometer for which the law WN/20000, where W is Newton and the N is speed in rpm. The air consumption is measured by air box method. The following readings were obtained: orifice of diameter = 30 mm, stroke = 120mm, Bore = 100 mm, Brake load = 560 N, C/H ratio by mass 85/15, C_d of orifice = 0.6, Ambient pressure = 1 bar, Pressure drop across the orifice = 14.5 cm of Hg. Time taken for 100 cc fuel consumption = 20 sec. Ambient temperature = 27^0C, Fuel density = 835 kg/m^3. N= 2400.
Calculate
i) Brake power ii) Torque iii) BSFC
iv) Percentage of excess air supplied v) Volumetric efficiency. [16]

2.a) Derive the equation for the optimum pressure ratio for two stage compression with perfect inter cooling and extend it for n number of cylinders.

b) A single stage double acting air compressor of 62.5 kW I.P. running at 120 rpm takes air at 1 bar and delivers at 10 bar. Assuming the law of expansion and compression as $pv^{1.35}$ = constant, find the diameter and stroke of the cylinder if the stroke to bore ratio is 1.25. [16]

3.a) Differentiate between positive displacement compressors and dynamic compressors.

b) A centrifugal air compressor delivers 15 kg of air, per minute. The inlet and outlet conditions of air are V_1 = 10 m/s, p_1 = 1 bar, v_{s1} = 0.5 m^3/kg, and V_2 = 80 m/s, p_2 = 7 bar, v_{s2} = 0.15 m^3/kg. The increase in enthalpy of air passing through the compressor is 160 kJ/kg and heat loss to the surroundings is 720 KJ/min. Find the power required to drive the compressor. Assume that inlet and discharge lines are at the same level. [16]

4.a) A refrigerating unit is working between 40^0C and -10^0C. The load on the unit is 5 tons. Find:
i) COP of the system;
ii) Power required to run system.
Assume that the refrigerant is dry and saturated vapour leaving the evaporator and compression is isentropic. The refrigerant used is NH_3.
If the temperature of the refrigerant required in the evaporator is -20^0C, then, find the change in COP of the system and the power required.

b) Draw the layout of summer air conditioning system and explain its working principle along with psychrometric chart. [16]

5.a) How do you classify the I C Engines based on governing mechanism, number of strokes and number of cylinders? Explain them.

b) Draw the battery ignition system and explain the important points. [16]

6.a) What are different major losses involved in S I Engine in comparison with the air standard cycle and draw the actual cycle? Explain.

b) What are different factors influencing the ignition lag of S I Engine? Explain them in detail. [16]

7.a) What is diesel knock? What are the favorable conditions for knocking in C I Engines? How to control knocking?

b) Draw the schematic diagram of divided combustion chamber and explain its working. [16]

8.a) What are the good requirements for diesel fuel and explain the importance of fuel rating?

b) Draw the actual and ideal P-θ diagram and explain different stages of combustion in S I Engine. [16]

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Code No:RR220303 | RR | SET-4

B.Tech II Year - II Semester Examinations, April/May-2012
THERMAL ENGINEERING - I
(MECHANICAL ENGINEERING)

Time: 3 hours **Max. Marks: 80**

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

1.a) Differentiate between positive displacement compressors and dynamic compressors.

b) A centrifugal air compressor delivers 15 kg of air, per minute. The inlet and outlet conditions of air are V_1 = 10 m/s, p_1 = 1 bar, v_{s1} = 0.5 m^3/kg, and V_2 = 80 m/s, p_2 = 7 bar, v_{s2} = 0.15 m^3/kg. The increase in enthalpy of air passing through the compressor is 160 kJ/kg and heat loss to the surroundings is 720 KJ/min. Find the power required to drive the compressor. Assume that inlet and discharge lines are at the same level. [16]

2.a) A refrigerating unit is working between 40^0C and -10^0C. The load on the unit is 5 tons. Find:
i) COP of the system;
ii) Power required to run system.
Assume that the refrigerant is dry and saturated vapour leaving the evaporator and compression is isentropic. The refrigerant used is NH_3.
If the temperature of the refrigerant required in the evaporator is -20^0C, then, find the change in COP of the system and the power required.

b) Draw the layout of summer air conditioning system and explain its working principle along with psychrometric chart. [16]

3.a) How do you classify the I C Engines based on governing mechanism, number of strokes and number of cylinders? Explain them.

b) Draw the battery ignition system and explain the important points. [16]

4.a) What are different major losses involved in S I Engine in comparison with the air standard cycle and draw the actual cycle? Explain.

b) What are different factors influencing the ignition lag of S I Engine? Explain them in detail. [16]

5.a) What is diesel knock? What are the favorable conditions for knocking in C I Engines? How to control knocking?

b) Draw the schematic diagram of divided combustion chamber and explain its working. [16]

6.a) What are the good requirements for diesel fuel and explain the importance of fuel rating?

b) Draw the actual and ideal P-θ diagram and explain different stages of combustion in S I Engine. [16]

7.a) How to measure the frictional power in I C Engine using retardation test? Explain.

b) A power output (in kW) of six cylinder four stroke engine is absorbed by hydraulic dynamometer for which the law WN/20000, where W is Newton and the N is speed in rpm. The air consumption is measured by air box method. The following readings were obtained: orifice of diameter = 30 mm, stroke = 120mm, Bore = 100 mm, Brake load = 560 N, C/H ratio by mass 85/15, C_d of orifice = 0.6, Ambient pressure = 1 bar, Pressure drop across the orifice = 14.5 cm of Hg. Time taken for 100 cc fuel consumption = 20 sec. Ambient temperature = 27^0C, Fuel density = 835 kg/m^3. N= 2400.

Calculate

i) Brake power ii) Torque iii) BSFC

iv) Percentage of excess air supplied v) Volumetric efficiency. [16]

8.a) Derive the equation for the optimum pressure ratio for two stage compression with perfect inter cooling and extend it for n number of cylinders.

b) A single stage double acting air compressor of 62.5 kW I.P. running at 120 rpm takes air at 1 bar and delivers at 10 bar. Assuming the law of expansion and compression as $pv^{1.35}$ = constant, find the diameter and stroke of the cylinder if the stroke to bore ratio is 1.25. [16]

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