Code No: RT22032 **R13** SET - 1

II B. Tech II Semester Regular Examinations, April/May - 2016
THERMAL ENGINEERING-I
(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1. a) Draw p-v and T-s diagrams for air standard Otto cycle and mark various energy interactions. (4M)
   b) Draw ideal and actual valve timing diagram of a 4-s SI engine. (4M)
   c) List out various factors influencing flame speed. (3M)
   d) Explain why useful power output at the end of the shaft is called as brake power. (4M)
   e) Write detailed classification of compressors. (3M)
   f) Which types of compressors are used in air craft applications? State the reasons clearly. (4M)

PART –B

2. a) Compare and contrast the actual cycles and fuel-air cycles of S.I Engine? (8M)
   b) Is the effect of compression ratio on efficiency as same in fuel-air also? Explain. (8M)

3. a) Draw the schematic diagram of simple carburetor and explain its working principle. (8M)
   b) Differentiate between Magneto ignition system with battery coil ignition system. (8M)

4. a) Explain different stages of combustion in S.I. Engine along with p-θ diagram. (8M)
   b) What are different methods to control the knocking in S.I. Engine? Explain. (8M)

5. A four stroke petrol engine with a compression ratio of 6.5 to 1 and total piston displacement of 5.2×10^{-3} m^3 develops 100 kW brake power and consumes 33 kg of petrol per hour of calorific value 44300 kJ/kg at 3000 rpm. Find: (16M)
   i) Brake mean effective pressure, ii) Brake thermal efficiency
   iii) Air standard efficiency ($\gamma = 1.4$); and iv) Air-fuel ratio by mass.
   Assume a volumetric efficiency of 80 %. One kg of petrol vapour occupies 0.26 m^3 at 1.013 bar and 15^0C. Take R for air 287 J/kg K.

6. a) Derive an expression for the optimums inter cooler pressure for two stage reciprocating air compressors with perfect inter cooling. (8M)
   b) Differentiate between positive displacement compressors and dynamic compressors. (8M)

7. a) Draw the velocity triangles for the centrifugal compressor and derive the equation for the estimation of power required to compress the air. (8M)
   b) Define and explain the terms pressure coefficient and adiabatic coefficient of a centrifugal compressor. (8M)

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Code No: RT22032 **R13** SET - 2

II B. Tech II Semester Regular Examinations, April/May - 2016
THERMAL ENGINEERING-I
(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1. a) Draw p-v and T-s diagrams for air standard Diesel cycle and mark various energy interactions. (4M)
   b) Draw ideal and actual port timing diagram of a 2-s SI engine. (4M)
   c) List out various factors influencing delay period. (3M)
   d) Write the importance of heat balance sheet. (4M)
   e) Out of isothermal and adiabatic compression process, which of the processes consume less work done? Why? (4M)
   f) Draw inlet and outlet velocity triangles of an axial flow compressors. (3M)

PART -B

2. a) What is the significance of stroke to bore ratio on IC Engine performance? Explain. (8M)
   b) Why the actual cycle efficiency is much lower than the air standard cycle efficiency? List the major losses in the actual engine. (8M)

3. a) Why the fuel injection system is required in C.I Engine? (8M)
   b) What are the important requirements of fuel injection system in a C.I Engine? (8M)

4. a) What is detonation in C.I. Engine? Explain the phenomenon of detonation and its ill effects on engine performance. (8M)
   b) What is abnormal combustion in S.I. Engine? Compare the abnormal combustion with normal combustion. (8M)

5. a) A diesel engine has a compression ratio of 14 to 1 and the fuel supply is cut off at 0.08 of the stroke. If the mass of the fuel is 0.26 kg/kWh, having calorific value of 43700 kJ/kg. Determine the relative efficiency of the engine. (8M)
   b) Explain Willan's line method of determination of frictional power (8M)

6. a) Derive the expression for the volumetric efficiency of a reciprocating air compressor in terms of clearance ratio, pressure ratio and index of the compression. (8M)
   b) Compare and differentiate among the fan, blower and compressor. (8M)

7. a) Define the term slip factor and power input factor with respect to the centrifugal compressor. Explain them. (8M)
   b) Draw the schematic diagram of axial flow air compressor and explain its working along with velocity triangles. (8M)

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Code No: RT22032 **R13** SET - 3

II B. Tech II Semester Regular Examinations, April/May - 2016
THERMAL ENGINEERING-I
(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1.	a)	What is loss due to gas exchange process?	(4M)
	b)	What is supercharging? Explain.	(4M)
	c)	Explain octane rating of fuels.	(4M)
	d)	What are different methods used to determine air flow rate? Write the formula, when orifice meter is used.	(3M)
	e)	Explain how intercooling reduce work input to the compressor.	(4M)
	f)	What is the function of a diverging passage in a centrifugal casing?	(3M)

PART -B

2.	a)	Explain with the help of p-v diagram the loss due to variation of specific heats in Otto cycle?	(8M)
	b)	Derive the expression for air standard efficiency of Otto cycle.	(8M)
3.	a)	What are the major differences between S.I. Engine and C.I. Engine? Explain them with suitable examples	(8M)
	b)	Explain the need and importance of cooling in an I.C. Engine	(8M)
4.	a)	Define the term flame velocity? Explain the influence of different operating parameters on flame propagation in S.I. Engine combustion.	(8M)
	b)	What is the difference between physical delay and chemical delay? Explain its importance.	(8M)
5.	a)	The following date 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	(8M)
	b)	What is the use of heat balance sheet of an engine? Mention the various items to be determined to complete the heat balance sheet.	(8M)
6.		A single stage single acting reciprocating air compressor with 0.3 m bore and 0.4 m strokeruns at 400 rpm. The suction pressure is 1 bar at 300 K and the delivery pressure is 5 bar. Find the power required to run it, if the compression is isothermal, adiabatic and compression follow $pv^{1.3} = C$. Also find the isothermal efficiency.	(16M)
7.	a)	What is positive displacement compressor? Explain the working principle of Vane sealed compressor.	(8M)
	b)	What are different losses occurring in the centrifugal compressor due to different blade shapes? Explain.	(8M)

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Code No: RT22032 **R13** SET - 4

II B. Tech II Semester Regular Examinations, April/May - 2016
THERMAL ENGINEERING-I
(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1. a) Draw p-v and T-s diagrams for air standard Dual cycle and mark various energy interactions. (3M)
   b) What is valve overlap period? Explain its significance. (4M)
   c) Explain Cetanerating of fuels. (4M)
   d) List out various methods used to determine friction power of an IC engine? Which of those you think, will give more accurate results. (4M)
   e) Will it be possible to increase volumetric efficiency of compressor beyond 100%? Why? (3M)
   f) Draw neat sketch of roots blower and p-v diagram for compression through it. (4M)

PART -B

2. a) Discuss the differences between fuel-air and actual cycles. (8M)
   b) Write a note in Exhaust blowdown losses. (8M)

3. Illustrate the constructional details of an I.C engines? Explain briefly about the important components and its materials? (8M)

4. a) Explain the phenomena of detonation in S.I. Engine? What are different parameters influence the knocking in S.I. Engine. (8M)
   b) Explain the influence of turbulence and speed on delay period in C.I. Engine combustion. (8M)

5. 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 ambienttest 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 efficiency. (8M)

6. a) Draw the T-s diagram for the multi stage compression and show the work saving during the compression in comparison with single stage reciprocating air compression. (8M)
   b) Explain how the use of intermediate pressure for minimum work results in equal pressure ratios in the two stages of compression, equal discharge temperatures, and equal work for the two stages. (8M)

7. a) Explain the working principle of Roots blower with suitable diagrams. (8M)
   b) What are different parameters influence the performance of the centrifugal compressors? Explain. (8M)

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