Code No: R1622032 **R16** SET - 1

II B. Tech II Semester Regular Examinations, April - 2018
THERMAL ENGINEERING-I
(Com to ME, AME)

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 **FOUR** Questions from **Part-B**

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PART –A

1.	a)	What is a cycle? What is the difference between an ideal and actual cycle?	(3M)
	b)	What is supercharging? How is it achieved?	(2M)
	c)	``Auto-ignition is the cause of detonation``. Justify the statement.	(2M)
	d)	What do you mean by performance of IC engine?	(2M)
	e)	Why is an external power input needed to drive a compressor? What are the uses of compressed gases?	(3M)
	f)	What do you understand by a slip factor in dynamic compressors?	(2M)

PART -B

2.	a)	Discuss in detail, i) pumping losses and ii) rubbing friction losses in IC engines.	(8M)
	b)	In an ideal diesel cycle, the temperature at the beginning of compression, at the end of compression and at the end of the heat addition are 97^0C, 789^0C and 1839^0C. Find the efficiency of the cycle?	(6M)
3.	a)	Discuss the requirements of an ideal injection.	(4M)
	b)	With the help of a neat sketches, explain the following: i) Thermo-syphon cooling system ii) Forced circulation cooling system	(10M)
4.	a)	Explain, how do the injection timing and the fuel quality affect the engine knock?	(6M)
	b)	Bring out clearly the process of combustion in CI engines and also explain the various stages of combustion.	(8M)
5.	a)	Discuss the various methods for measurement of brake power?	(6M)
	b)	A six cylinder, four stroke petrol engine having a bore of 90mm and stroke of 100mm has a compression ratio of 7. The relative efficiency with reference to indicated thermal efficiency is 55% when the indicated specific fuel consumption is 0.3 kg/kWh. Estimate the calorific value of fuel and fuel consumption (in kg/h), given that the imep is 8.5bar and speed is 2500rpm.	(8M)
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6. a) Discuss the comparison between centrifugal and reciprocating compressors. (6M)

   b) A two stage air compressor takes in air at a pressure of 1.013bar and temperature 16^0C. The inter-cooling is perfect. The delivery pressure is 19bar. Find the condition for minimum work of compression and also the work input required to compress 1kg of air. Take n=1.3 (8M)

7. a) With the help of a neat sketch, explain the working of a Lysholm compressor. (7M)

   b) Describe with a neat sketch the construction and working of a single-stage single-acting reciprocating air compressor. (7M)

Code No: R1622032 **R16** SET - 2

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THERMAL ENGINEERING-I
(Com to ME, AME)

Time: 3 hours Max. Marks: 70

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2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) What do you understand by air standard efficiency? (2M)
   b) Discuss the limits of turbo-charging? (2M)
   c) ``The highest compression ratio that can be used in a S.I. engine is limited by the detonation characteristics of the available fuel``. Justify the statement. (3M)
   d) Distinguish between the power and specific output. (2M)
   e) Is it essential to maintain clearance between cylinder head and piston? Give reasons. (3M)
   f) What do you mean by pressure coefficient in dynamic compressors? (2M)

PART -B

2. a) Define volumetric efficiency and discuss the effect of various factors affecting the volumetric efficiency. (7M)
   b) What will be loss in the ideal efficiency of a diesel engine with compression ratio 14 if the fuel cut off is delayed from 6% to 9%? (7M)

3. a) Describe a battery ignition system with the help of a sketch. (7M)
   b) What do you understand by ignition timing? Discuss the various factors which affect ignition timing requirements. (7M)

4. a) Does the flame front exist in a C.I.engine? Explain. (6M)
   b) What is meant by abnormal combustion? Explain the phenomena of knock in SI engines. (8M)

5. a) Describe the Morse test. What is the assumption made in this test? What precautions should be taken in performing this test? What is the accuracy of this test? (6M)
   b) A 4 cylinder engine running at 1200rpm delivers 20kW. The average torque when one cylinder was cut is 110Nm. Find the indicated thermal efficiency if the calorific value of the fuel is 43MJ/kg and the engine uses 360grams of gasoline per kWh. (8M)

6. a) Explain in detail, the comparison between centrifugal and axial flow compressors. (6M)
   b) The pressure in the mains of a compressed air service is to be 8.1bar and a supply of $28m^3/h$ at 25^0C and that pressure is to be maintained. The air is compressed from an initial pressure of 1.063bar by a two stage compressor in which the compression is adiabatic and the air is cooled to its initial temperature of 15^0C in the inter-cooler. What is the minimum power required to compress the air. (8M)
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7. a) Derive an expression for volumetric efficiency of a reciprocating compressor and discuss its physical significance. (7M)
   b) Discuss the working principle and mechanical details of a root blower. (7M)

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II B. Tech II Semester Regular Examinations, April - 2018
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(Com to ME, AME)

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 **FOUR** Questions from **Part-B**

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PART –A

1. a) What do you understand by relative efficiency of an IC engine? (2M)
   b) Discuss the functions of lubricant in an engine. (2M)
   c) ``The retarding of spark timing in a S.I. engine will reduce detonation``. Justify the statement. (2M)
   d) Define mean effective pressure and distinguish between brake mean effective pressure and indicated mean effective pressure. (3M)
   e) Define volumetric efficiency and state what are the factors on which it depends? (3M)
   f) What do you mean by power input factor of a dynamic compressor? (2M)

PART -B

2. a) What is exhaust blow down loss? Discuss the optimum opening position of exhaust valve to reduce this loss. (7M)
   b) The compression ratio in an air-standard Otto cycle is 8. At the beginning of compression process, the pressure is 1bar and the temperature is 300K. The heat transfer to the air per cycle is 1900 kJ/kg of air. Calculate: i) thermal efficiency ii) the mean effective pressure (7M)

3. a) What do you understand by ignition? What relation ignition has with combustion? (4M)
   b) With the help of neat sketches, explain the following: (10M)
   i)Evaporative cooling system ii)Pressure cooling system

4. a) Why is flame speed important? Discuss the factors that affect the flame speed? (5M)
   b) What are the various types of combustion chambers used in SI engines? Explain them briefly. (9M)

5. a) What are the various methods of measuring indicated power? Briefly compare their relative accuracy. (6M)
   b) A six cylinder 4-stroke SI engine having a piston displacement of 700cm^3 per cylinder developed 78kW at 3200rpm and consumed 27kg of petrol per hour. The calorific value of petrol is 44MJ/kg. Estimate : (8M)
      i) The volumetric efficiency of the engine if the air-fuel ratio is 12 and intake air is at 0.9bar, 32^{0}C
      ii) The brake thermal efficiency and
      iii) The brake torque.
      For air, R=0.287kJ/kg K
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6. a) How will you classify the compressors? Differentiate between the working principles of positive displacement and dynamic compressors. (7M)

   b) The free air delivered by a single stage, double acting air compressor measured at 1.013bar and 15^0C is 14m^3/min. The pressure and temperature in the cylinder during induction are 0.95bar and 32^0C. The delivery pressure is 7bar and the index of compression and expansion, n=1.3. If the clearance volume is 5% of the swept volume, calculate the indicated power and volumetric efficiency. (7M)

7. a) Discuss the working of a vane sealed compressor. (7M)

   b) Explain the working and mechanical details of centrifugal compressors with the help of h-s chart. (7M)

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

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PART –A

1. a) State the assumptions made for air standard cycles. (2M)
   b) Why cooling of an internal combustion engine is necessary? (2M)
   c) ``The factors that tend to increase detonation in S.I. engine tend to reduce knocking in C.I. engine``. Discuss the above statement with reference to the following influencing factors: (4M)
   i)Compression ratio ii)Inlet temperature
   d) List the parameters by which performance of an engine is evaluated? (2M)
   e) What are the effects of clearance on the performance of reciprocating compressors? (2M)
   f) What do you understand by an adiabatic coefficient in dynamic compressors? (2M)

PART -B

2. a) Discuss briefly the loss due to gas exchange process in an IC engine. (6M)
   b) A compression ignition engine has a stroke 270mm, and a cylinder diameter of 165mm. The clearance volume is 0.000434m^3 and the fuel ignition takes place at constant pressure for 4.5% of the stroke. Find the efficiency of the engine assuming it works on the diesel cycle. (8M)

3. a) What is the function of carburetor in an S.I. engine? Briefly explain with a neat sketch the operation of a simple float type carburetor? (8M)
   b) Discuss with the help of a suitable sketch the Wet sump lubrication system. (6M)

4. a) Define combustion. What are the general conditions necessary for combustion? (5M)
   b) Explain with figures, various types of combustion chambers used in CI engines. (9M)

5. a) What is Willan`s line method? To which type of engine it is applicable? What is the accuracy of this method? (6M)
   b) Find the brake specific fuel consumption in kg/kWh of a diesel engine whose fuel consumption is 5grams per second when the power output is 80kW. If the mechanical efficiency is 75%, calculate the indicated specific fuel consumption. (8M)
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Code No: R1622032 **R16** SET - 4

6. a) What is a rotary compressor? How are rotary compressors classified? (5M)
   b) A single cylinder, single acting air compressor has a cylinder diameter of 15.25cm and a stroke of 22.8cm. Air is drawn into the cylinder at a pressure of 1.013bar and a temperature of 15.6^0C. It is compressed adiabatically to 6.1bar. Calculate the theoretical power required to drive the compressor if it runs at 100rpm and the mass of air compressed per minute. (9M)

7. a) Derive an expression of minimum work input to compress the gas in a two and three stage reciprocating air compressor with perfect and imperfect inter-cooling. (8M)
   b) Explain the working principle of axial flow compressor with a neat sketch. (6M)