II B. Tech II Semester Supplementary Examinations, November - 2019
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) Draw the P-v plot of actual cycle and Fuel-air cycle for the optimum spark advance. (3M)
   b) What is the need of providing lubrication to the IC engine? (2M)
   c) What is meant by delay period? (2M)
   d) Define Volumetric efficiency? Explain its importance for calculation of volumetric efficiency in the performance test? (3M)
   e) Define the volumetric efficiency of the reciprocating compressor. (2M)
   f) Define degree of reaction for the axial flow compressor? (2M)

PART –B

2. a) Briefly discuss pumping, rubbing friction losses and gas exchange process. (7M)
   b) Define volumetric efficiency and discuss the effect of various factors affecting the volumetric efficiency. (7M)
3. a) Explain the wet sump lubrication system with neat sketch. (7M)
   b) Explain about the Forced circulation cooling system with neat sketch. (7M)
4. a) Explain the phenomenon of knock in SI engines. (7M)
   b) Explain with figures the various types of combustion chambers used in SI engines. (7M)
5. a) Why morse test is not used for single cylinder engine? Describe the method of finding friction power using Morse test. (7M)
   b) A four cylinder engine running at 1200 rpm delivers 20kW.The average torque when one cylinder was cut is 110 Nm. Find the indicated thermal efficiency if the calorific value of the fuel is 43 MJ/kg and the engine uses 360 grams of gasoline per kW h. (7M)
6. A single-acting two stage air compressor delivers air at 18 bar. The temperature and pressure of the air before the compression in LP cylinder are 25^0C and 1 bar. The discharge pressure of LP cylinder is 4.2 bar. The pressure of air leaving the intercooler is 4 bar and the air is cooled to 25^0C.The diameter and stroke of LP cylinder are 40 cm and 50 cm respectively. The clearance volume is 5% stroke in both cylinders. The speed of the compressor is 200 rpm. Assuming the index of compression and re-expansion in both the cylinders as 1.25 , C_p for air = 1.004 kJ/kgK, find (14M)
   (i) Power required to run the compressor and
   (ii) Heat rejected in intercooler/min
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7. Air at a temperature of 290 K flows in a centrifugal compressor running at 20000 rpm. The other data is as follows: (14M)
Slip factor= 0.80 ; Isentropic total head efficiency =0.75 ; Outer diameter of blade tip = 500 mm
Determine :
   (i) The temperature rise of air passing through the compressor
   (ii) The static pressure ratio.
   (iii) Assume that the velocities of air at inlet and exit of the compressor are same