II B. Tech II Semester Supplementary Examinations, April - 2021
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) Define time and heat loss factors.   (2M)

   b) State the purpose of thermostat in an engine cooling system.   (3M)

   c) List the four stages of combustion in CI engine.   (2M)

   d) Define the brake power.   (2M)

   e) Give the expression for work done for a two-stage compression with prefect   (3M)
   intercooling.

   f) List various advantages of centrifugal compressors over axial flow   (2M)
   compressors.

PART -B

2. a) Write short note on Actual and Fuel-Air Cycles of CI Engines.   (7M)

   b) Discuss the various factors affecting the volumetric efficiency.   (7M)

3. a) Draw the sketch of a four stroke SI engine valve timing diagram and explain.   (7M)

   b) Explain the splash lubrication system with the help of a neat sketch.   (7M)

4. a) What are different methods to control the knocking in S.I. Engine? Explain.   (7M)

   b) What is the difference between physical delay and chemical delay? Explain its   (7M)
   importance.

5. a) In a test of a four-cylinder, four – stroke engine 75 mm bore and 100 mm   (7M)
   stroke, the following results were obtained at full throttle at a particular
   constant speed and with fixed setting of fuel supply of 6.0 kg/h.
   B.P. with all cylinder working = 15.6 kW;
   B.P. with cylinder no 1 cut –out = 11.1 kW;
   B.P. with cylinder no 2 cut –out = 11.03 kW;
   B.P. with cylinder no 3 cut –out = 10.88 kW;
   B.P. with cylinder no 4 cut –out = 10.66 kW;
   If the calorific value of the fuel is 83600 kJ/kg and clearance volume is 0.0001
   m^3. Calculate: (i) Mechanical efficiency. (ii) Indicated thermal efficiency. (iii)
   Air standard efficiency.

   b) Following observations were recorded during a single cylinder oil engine bore   (7M)
   300 mm, stroke 450 mm, speed 300 rpm, IMPE 6 bar, net brake load 1.5 kN,
   brake drum diameter 1.8 meters, brake rope diameter 2 cm. Calculate the (i)
   Indicated power. (ii) Brake power. (iii) Mechanical efficiency.

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6. a) Derive the expression for work done per kg of air delivered for a single acting single cylinder reciprocating compressor considering clearance.   (7M)
    b) A single acting reciprocating compressor having L/D ratio = 1.5 has the cylinder diameter of 200 mm runs at 100 rpm. The compressor compresses air at 1 bar, 300 K to a pressure of 8 bar according to the law $pv^{1.25}$ = constant. Find the indicated power of the compressor, mass of air delivered, temperature of air delivered. Also calculate power required to drive the compressor if mechanical efficiency is 80%.   (7M)

7. a) Explain the terms slip factor and power input factor in centrifugal compressors?   (7M)
    b) An axial flow compressor having eight stages and with 50% reaction compresses air in the pressure ratio of 4:1. The air enters the compressor at 20^0C and flows through it with a constant speed of 90m/s. The rotating blades of compressor rotate with a mean speed of 180m/s. Isentropic efficiency of the compressor may be taken as 82%. Calculate: i) Work done by the machine, ii) Blades angles.   (7M)