

II B. Tech II Semester Regular/Supplementary Examinations, November - 2020**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**

PART -A

1. a) What are assumptions made in air standard cycles? (2M)
- b) List the main parts of a lubrication system. (3M)
- c) Define the phenomenon Knocking in spark ignited engines. (2M)
- d) How can you improve the performance of IC engine. (2M)
- e) Evaluate the necessity of clearance in reciprocating compressors. (3M)
- f) Give two examples of positive displacement and rotary compressors. (2M)

PART -B

2. a) Why the actual cycle efficiency is much lower than the air standard cycle efficiency? List the major losses in the actual engine. (7M)
- b) Write a note in Exhaust blow-down losses. (7M)
3. a) Discuss the difference between theoretical and actual valve timing diagram of a diesel engine. (7M)
- b) With the help of a neat sketch explain the working of fuel supply system of an IC engine. (7M)
4. a) Explain normal and abnormal combustions in SI engine. (7M)
- b) What are the types of combustion chambers used in C.I. engines and explain their role in generating turbulence. (7M)
5. a) List the different methods used for finding friction power and indicated power of an engine Explain in detail. (7M)
- b) A test on a single-cylinder, four-stroke oil engine having a bore of 15 cm and stroke 30 cm gave the following results; speed 300 rpm; brake torque 200 Nm; indicated mean effective pressure 7 bar; fuel consumption 2.4 kg/h; cooling water flow 5 kg/min; cooling water temperature rise 35⁰C; air-fuel ratio 22; exhaust gas temperature 410⁰C; barometer pressure 1 bar; room temperature 20⁰C. The fuel has a calorific value of 42 MJ/kg and contains 15% by weight of hydrogen. Take latent heat of vaporization as 2250 kJ/kg. Determine: (i) The indicated thermal efficiency. (ii) The volumetric efficiency based on atmospheric conditions. Draw up a heat balance in terms of kJ/min. Take C_p for dry exhaust gas = 1 kJ/kgK and super-heated steam C_p = 2.1 kJ/kgK; R = 0.287 kJ/kgK. (7M)

6. a) Derive the work done for a single stage air compressor with and without clearance volume. (7M)
- b) A single stage single acting reciprocating air compressor takes in $17 \text{ m}^3/\text{min}$ at suction conditions of 100 KPa and 25°C . The delivery pressure is 700 KPa . The clearance volume is 6% of swept volume. The compression and expansion follows the law $PV^{1.3} = C$. The speed of the compressor is 600 rpm . Stroke to bore ratio is 1. Find the power required to drive the compressor and cylinder dimensions. (7M)
7. a) With help of a neat sketch explain the construction and working of an axial flow compressor. (7M)
- b) Draw the velocity triangles for the centrifugal compressor and derive the equation for the estimation of power required to compress the air. (7M)

