Code No: **20ME4T01**

R20

II B. TECH II SEMESTER REGULAR EXAMINATIONS, JUNE - 2022
APPLIED THERMODYNAMICS-I
(MECHANICAL ENGINEERING)

Time: 3 hours Max. Marks: 70

Note: Answer **ONE** question from each unit **(5 × 14 = 70 Marks)**

UNIT-I

1. a) Why the actual cycle efficiency is much lower than the air-standard cycle efficiency? List the major losses and differences in actual engine and air-standard cycles. [7M]
   b) Define volumetric efficiency and discuss the effect of various factors affecting the volumetric efficiency. [7M]

(OR)

2. a) Derive the air standard efficiency of Diesel cycle and draw P-V and T-S diagrams. [7M]
   b) What are the differences between actual cycle and fuel-air cycle analysis? [7M]

UNIT-II

3. a) Compare four-stroke and two-stroke cycle engines. [7M]
   b) Draw a schematic diagram of fuel feed pump and explain its working principle. [7M]

(OR)

4. a) Compare battery ignition and magneto ignition systems. [7M]
   b) Explain different types of cooling systems used for IC engines. Give the disadvantages of improper cooling. [7M]

UNIT-III

5. a) Explain the stages of combustion in S.I engines. [7M]
   b) What is physical delay and chemical delay in C.I Engines? [7M]

(OR)

6. a) Compare phenomena of knock in C.I engines and S.I engines. [7M]
   b) Explain the stages of combustion in C.I engines. [7M]

UNIT-IV

7. a) Explain the working of a rope brake dynamometer and also derive the expression of the brake power of an engine. [7M]
   b) A gasoline engine working on four stroke develops a brake power of 20.9 kW. A Morse test was conducted on this engine and the brake power (kW) obtained when each cylinder was [7M]

made inoperative by short circuiting the spark plugs are 14.9, 14.3, 14.8 and 14.5 respectively. The test was conducted at constant speed. Find the indicated power, mechanical efficiency and brake mean effective pressure, when all cylinders are firing. The bore of the engine is 75 mm and stroke is 90 mm. The engine is running at 3000 rpm.

(OR)

8. A test was carried out on a two-stroke diesel engine for one hour and the following observations were recorded: [14M]
Brake torque = 120 Nm; Speed = 600 rpm; Fuel used = 2.5 kg; Calorific value of fuel = 40.3 MJ/kg; Cooling water used = 818 kg; Rise in temperature of cooling water = 10°C. Specific heat of water =4187 J/kg.K, Exhaust gas temperature = 345°C. Room temperature = 25°C; A/F = 32/1. FP =1.5 kW, Cp (exhaust gases) =1050 J/kg K.
Determine:
i) BP ii) IP iii) Mechanical efficiency, iv) Indicated thermal efficiency, and v) Prepare heat balance sheet on one minute time basis.

UNIT-V

9. a) Derive the expression for volumetric efficiency of a single stage reciprocating air compressor. [7M]

b) An air compressor takes in air at 1bar and 20^0C and compresses it according to $pv^{1.2} = C$. It is then delivered to a receiver at a constant pressure of 10 bar. Determine [7M]
(i) Temperature at the end of compression
(ii) Work done during compression

(OR)

10. a) With a neat sketch explain the working of centrifugal compressor. [7M]

b) List out the differences between axial flow and centrifugal compressors. [7M]

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