

BACHELOR OF TECHNOLOGY (C.B.C.S.) (2020 COURSE)
B.Tech.Sem - IV MECHANICAL :SUMMER- 2022
SUBJECT : THERMODYNAMICS APPLICATIONS

Day : Tuesday
Date : 14-06-2022

S-24496-2022

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.

- 1) All questions are **COMPULSORY**.
 - 2) Figures to the **RIGHT** indicate **FULL** marks.
 - 3) Use of non-programmable calculator is **allowed**.
 - 4) Assume suitable data **WHEREVER** necessary.
 - 5) Draw neat diagram **WHEREVER** necessary.
 - 6) Use of Steam Table is **allowed**.
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Q.1 Explain with neat sketch construction and working of any two boiler mountings. (10)

OR

Q.1 Explain with neat sketch Working of Superheater. (10)

The following readings were recorded during boiler trial of 6 hour duration :
Pressure of steam generated = 12 bar, mass of steam generated = 40,000 Kg.
dryness fraction of steam generated = 0.85, feed water temperature = 30⁰C, coal
used = 4000 Kg, calorific value of coal = 33,400 kJ/Kg.

Find :

- i) Factor of equivalent evaporation
- ii) Equivalent evaporation from and at 100⁰C.
- iii) Efficiency of boiler.

Q.2 Give classification of the reciprocating compressor. Derive expression of work done for single stage reciprocating air compressor without clearance volume. (10)

OR

Q.2 A single stage, single acting reciprocating air compressor delivers 0.6 Kg/min of air at 6 bar. The temperature and pressure at suction stroke are 30⁰C and 1 bar respectively. The clearance volume is 3% of swept volume and index of expansion and compression is 1.3. The bore and stroke are 100 mm and 150 mm. resp. (10)

Determine :

- i) Volumetric efficiency of compressor.
- ii) Power required, if mechanical efficiency is 85% .
- iii) Speed of compressor.

Take specific gas constant for air $R = 0.287 \text{ kJ/KgK}$.

Q.3 Explain with neat sketch construction and working of gas turbine plant also explain effect of operating variables on thermal efficiency of gas turbine plant. (10)

OR

Q.3 Explain with neat sketch working of pulse jet and ram jet engines. (10)

Q.4 Explain the function of carburetor in case of S.I. engines. Explain with neat sketch working of simple carburetor. (10)

OR

Q.4 Write classification of the fuel injection system and explain with neat sketch any two solid injection systems. (10)

Q.5 Explain effect of engine variables on ignition lag and flame propagation in S.I. Engines. (10)

OR

Q.5 Explain with neat sketch valve timing diagram for C.I. Engines. Also explain stages of combustion in C.I. Engines with the help of P- θ diagram. (10)

PTO

Q.6 Explain with neat sketch Willan's Line Method to determine friction power of engine. (10)

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 obtained in kW when each cylinder was made non-operative by short circuiting the spark plug are 14.9, 14.3, 14.8 and 14.5 respectively. The test was conducted at constant speed. Find indicated power, mechanical efficiency and break mean effective pressure when all cylinders are firing.

The bore of Engine is 75 mm and stroke is 90 mm. the engine is running at 3000 rpm.

OR

Q.6 A two stroke diesel engine was subjected to motoring test. The wattmeter reading (F.P.) = 1.6 kW. The engine was then tested for one hour and following observations were made : (10)

Net brake torque = 125 Nm, Engine speed = 610 rpm., fuel consumption = 2.7 Kg, calorific value of fuel = 41000 kJ/Kg, Cooling water used = 825 Kg, temperature rise of cooling water = 8°C, temperature of exhaust gas = 350°C, room temperature = 30°C, air fuel ratio = 32:1, specific heat of exhaust gas = 1.05 kJ/KgK, specific heat of water = 4.187 kJ/KgK.

Calculate :

- i) Brake power
- ii) Indicated power
- iii) Mechanical efficiency
- iv) Indicated thermal efficiency
- v) Heat balance on minute and percentage basis.
