EXPERIMENT NO. 2

Aim: To determine the brake thermal efficiency of 4-stroke diesel engine at various load condition. Also plot the characteristic curve of efficiency and power verses percentage of load.

Engine specification: (write engine specification on which trial is conducted)

Procedure:

1. Check lubrication and fuel system and start fuel supply.
2. Start the engine by cranking handle at no load.
3. Start water supply for engine cooling and adjust proper flow rate of water.
4. Allow engine to run at no load for few minutes so that it gets warmed up.
5. Gradually increase the load by dynamometer at various load condition and measure the time for consumption of specific quantity of fuel (V). The reading are taken at each load condition.
6. Note down the reading of load on the dynamometer (W) in kg.
7. Measure the speed (N) and moment arm (R) of the engine, which remains constant throughout the test.
8. After the test unload the engine gradually.
9. Cut-off the fuel supply for stopping the engine by pulling the lever.
10. After 10 minutes, stop the water supply the engine.

Observation:

Testing laboratory: I. C. Engine Laboratory

Density of fuel (ρ) =830 kg/m^3

Calorific value of fuel (CV)= 43500 kJ/ kg

Momentum arm of dynamometer R (m) =185 mm

Observation Table:

Sr. No.	Speed (rpm)	Load (kg)	Fuel consumption (mL/min)	Fuel consumption (kg/sec)

Formula:

1. To determine brake power:

$$B.P. = \frac{2\pi NT}{60 \times 1000}$$

Where,

Torque, $T = W \times R \times 9.81$

$B.P. =$

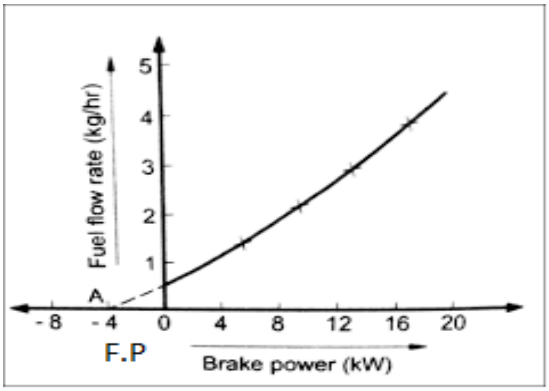
2. Mass of fuel consumption (mf) (in kg/hr)

$$= \frac{\text{Vol. of fuel (ml)} \times 3600 \times \text{Sp.gr. of fuel}}{\text{Time (s)} \times 1000}$$

3. To determine friction power (FP):

Calculated result data of BP and m_f, required to draw Williams line (*Graph attached)

SN	Load (kg)	BP (kW)	m_f(kg/hr)
1			
2			
3			
4			
5			
6			



Williams line method (for friction power)

From Williams line method;

F. P. = _____

I.P.= B.P. + F.P.

I.P.= _____

4. Input Power to the engine (Heat Supplied) in kW = m_f x CV (kW)
5. Brake thermal efficiency:

$$\eta_{Bth} = \frac{B.P. \times 3600 \times 100}{m_F \times C_V}$$

6. Indicated thermal efficiency:

$$\eta_{ith} = \frac{I.P. \times 3600 \times 100}{m_F \times C_V}$$

7. Mech. efficiency = Brake Power/Indicated Power

8. Specific Fuel Consumption (SFC):

$$BSFC = \frac{mf}{B.P}$$

Sample calculations:

Result:

Speed (rpm)	Load(kg)	Brake Power (kW)	Input Power (kW)	Indicated Power (kW)	Brake Thermal Efficiency (%)	Indicated thermal efficiency	Mechanical Efficiency	Specific Fuel Consumption

Conclusion:

Answer the following question:

Q.1 List various components of ICE. Schematically show all strokes in SI and CI engines.
Q.2 what is indicated power and frictional power of the engine?
Q.3 Define mechanical efficiency, thermal efficiency, and specific fuel consumption of the engine?
Q.5 State the importance of cooling of an I. C. Engine. What methods are generally employed for cooling of an I. C. Engines?
Q.6 Differentiate between: 4'stroke and 2'stroke engines, SI and CI engines.
Q.7 List engine specifications for 2 various models of bikes and light commercial vehicles.