Name:

Grade:

Due Date: 16/08/2021 (Due at the time of class)

Solve the following problems. Clearly justify all your assumptions.

Problem 1:

A four-cylinder, two-stroke cycle diesel engine with 10.9-cm bore and 12.6-cm stroke produces 88 kW of brake power at 2000 RPM. Compression ratio $r_c = 18{:}1$.

Calculate:

(a) Engine displacement. [cm^3, L] (2.5)
(b) Brake mean effective pressure. [kPa] (2.5)
(c) Torque. [N-m] (2.5)
(d) Clearance volume of one cylinder. [cm^3] (2.5)

Problem 2:

A four-cylinder, 2.4-liter engine operates on a four-stroke cycle at 3200 RPM. The compression ratio is 9.4:1, the connecting rod length $r = 18$ cm, and the bore and stroke are related as $S = 1.06B$.

Calculate:

(a) Clearance volume of one cylinder in cm^3, L, and $in.^3$. (2)
(b) Bore and stroke in cm and in. (2)
(c) Average piston speed in m/sec and ft/sec. (1)

Problem 3:

What are the advantages of an over square engine? What are the advantages of an under square engine? (7.5)

Problem 4:

A single-cylinder, four-stroke cycle CI engine with 12.9-cm bore and 18.0-cm stroke, operating at 800 RPM, uses 0.113 kg of fuel in four minutes while developing a torque of 76 N-m.

Calculate:

(a) Brake specific fuel consumption. [gm/kW-hr] (2)
(b) Brake mean effective pressure. [kPa] (2)
(c) Brake power. [kW] (2)
(d) Specific power. [kW/cm^2] (2)
(e) Output per displacement. [kW/L] (1)
(f) Specific volume. [L/kW] (1)

Problem 5:

Draw and briefly explain power and torque curve of an IC Engine. (7.5)

Problem 6:

A 1500-cm^3, four-stroke cycle, four-cylinder CI engine, operating at 3000 RPM, produces 48 kW of brake power. Volumetric efficiency is 0.92 and air–fuel ratio AF = 21:1.

Calculate:

(a) Rate of air flow into engine. [kg/sec] (2.5)

(b) Brake specific fuel consumption. [gm/kW-hr] (2.5)

(c) Mass rate of exhaust flow. [kg/hr] (2.5)

(d) Brake output per displacement. [kW/L] (2.5)