BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA-1000

Department of Mechanical Engineering

Course no: ME-418

Heat Engine Sessional

Credit Hours: 0.75

Name of the Experiments

1. (a) Assembly of an SI engine
   (b) Automobile system identification.
2. (a) Assembly of a CI engine
   (b) Study of Gray Marine Diesel Engine.
3. Performance test of a Petrol Engine for WOT.
4. Performance test of a Diesel Generator engine.
5. Study of the gas engine of BUET power plant.

Course no: ME-418

EXPERIMENT NO. 01(a)
ASSEMBLY OF AN SI ENGINE

OBJECTIVES

a. Identification and studying the functions of different engine components
b. Disassembling the engine
c. Reassembling the engine
d. Testing the assembly procedure by starting the engine

ENGINE SPECIFICATIONS

Bore	
Stroke	
No of cylinders	
Arrangement of cylinders	
Cam shaft type	
No of spark plugs	
Starter motor battery voltage	
Turbocharger availability	

PROCEDURE

1. **Overview of the engine in order to identify different components of it.**

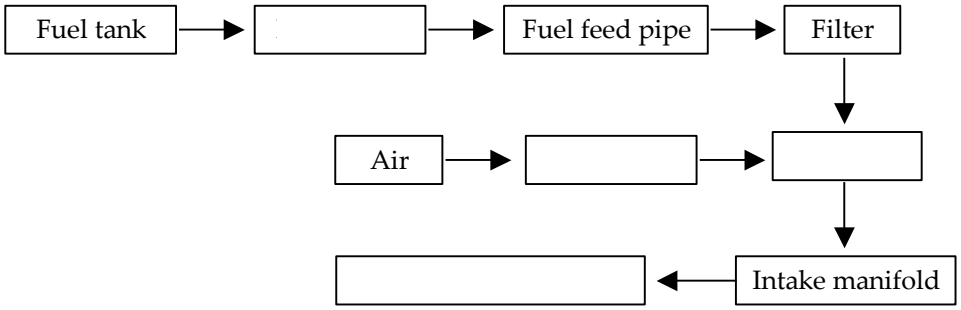
2. **Dismantling:**
   i) Drain out the lubricating oil and water
   ii) Remove the head cover
   iii) Remove the cylinder head (Intake & Exhaust manifold and carburetor)
   iv) Remove rocker arm along with push rod
   v) Remove bottom covers (Sump)
   vi) Upright the assembly to observe the crankshaft
3. **Do the necessary schematic diagram and note the different types of bearing.**

4. **Assembling:**
   Almost reverse sequence of dismantling of followed during assembling

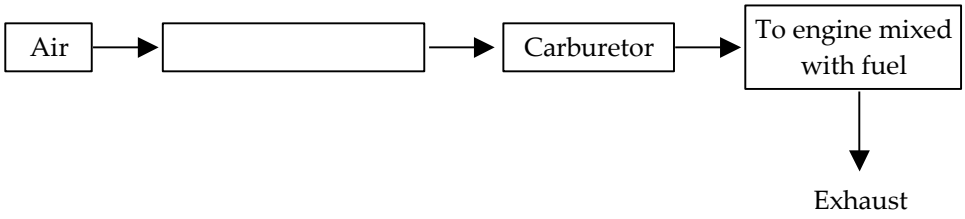
REPORT WRITING

A. Identify the missing components of the following systems and briefly state their functions.

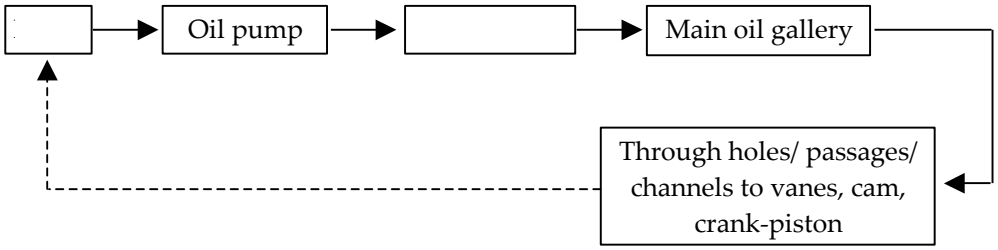
1. Fuel Supply System:



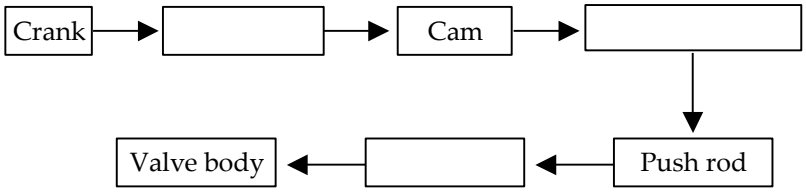
2. Air intake and exhaust circuit:



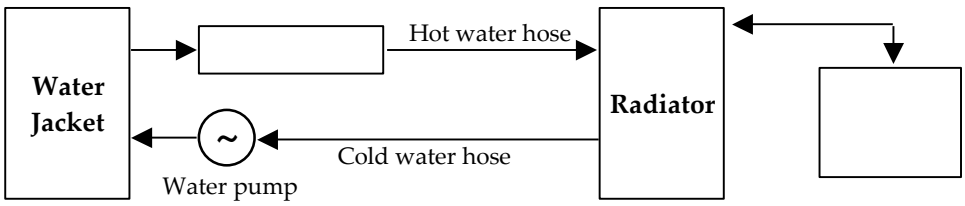
3. Lub. Oil system:



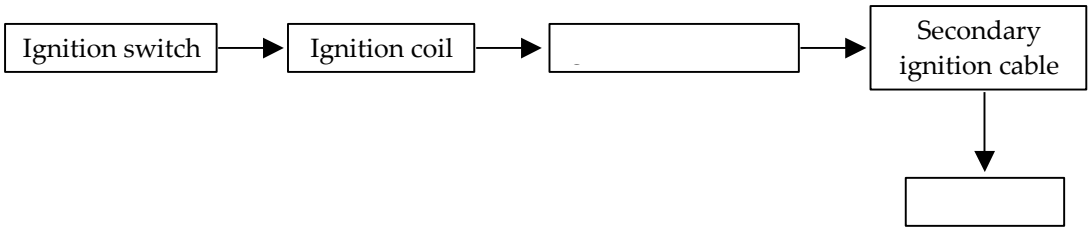
4. Valve operating system:



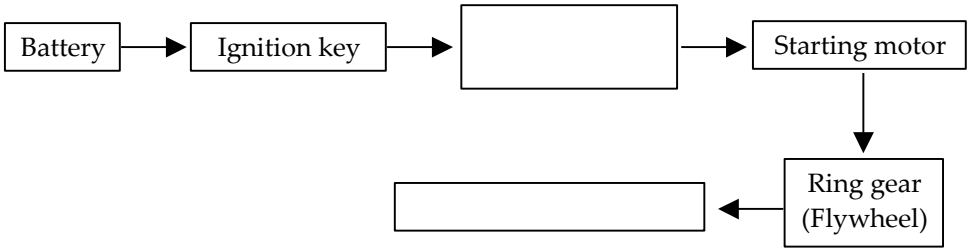
5. Cooling water circuit:



6. The spark Ignition system: (Mechanical CB type)



7. The starting and electrical charging system:



B. Questions:

Provide the following information briefly regarding to your observation in the experiment.

i) No of cylinder rings, their types and functions

ii) No of bearings, their types and functions

iii) No of valves and mention which one was bigger, why?

iv) Location of thermostat in cooling water circuit

v) Location of CB point and No. of Cam lobes operating it

vi) Identify the missing components of TOYOTA LITE ACE 1300 CC in the following page

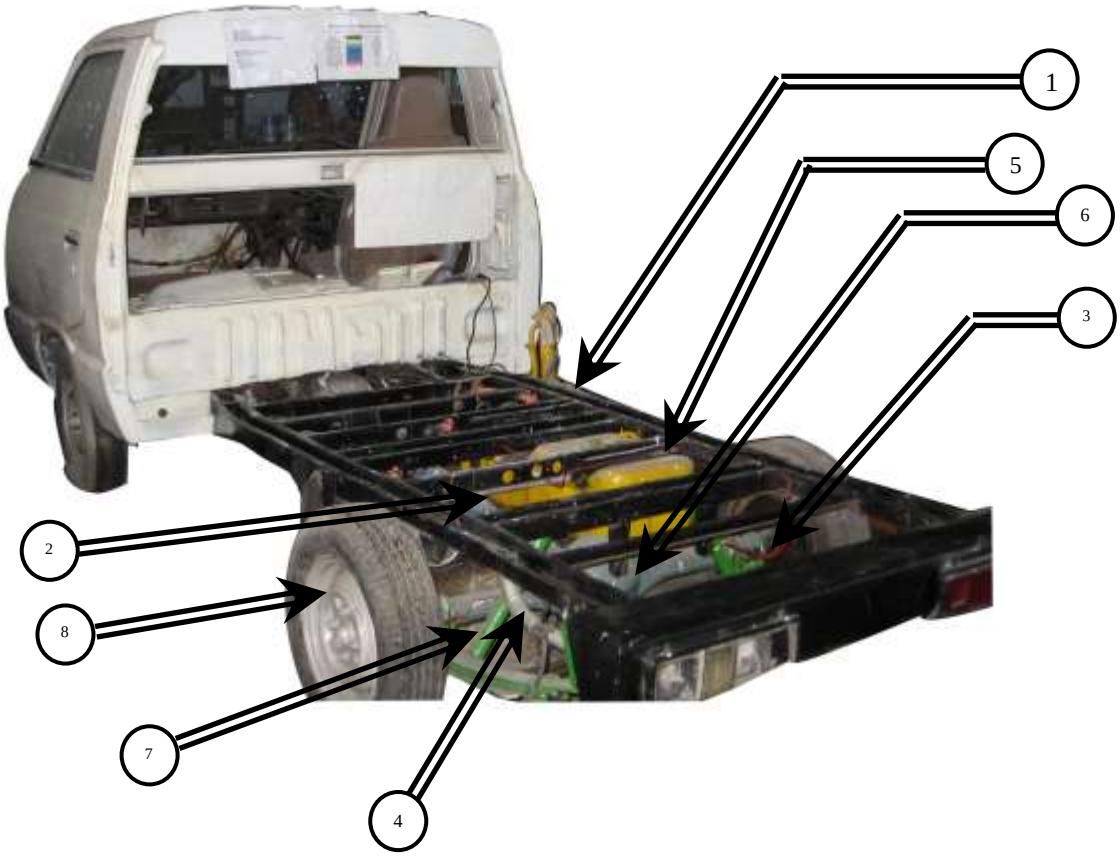
---

C. Discussion:

Discuss the above study and express your comments regarding the experiment.

EXPERIMENT NO. 01(b)

AUTOMOBILE SYSTEM IDENTIFICATION



1	Black	
2	Light Blue	
3	Red	
4	Silver	
5	Yellow	
6	Ash	
7	Green	
8	Ash	

EXPERIMENT NO. 02(a)

ASSEMBLY OF A CI ENGINE

1. **Overview of the engine in order to identify different components of it.**

2. **Record the name plate data.**

3. **Engine specifications:**

Bore	
Stroke	
No of cylinders	
Cam shaft type	
Injection type	
Arrangement of cylinders	

4. **Dismantling:**

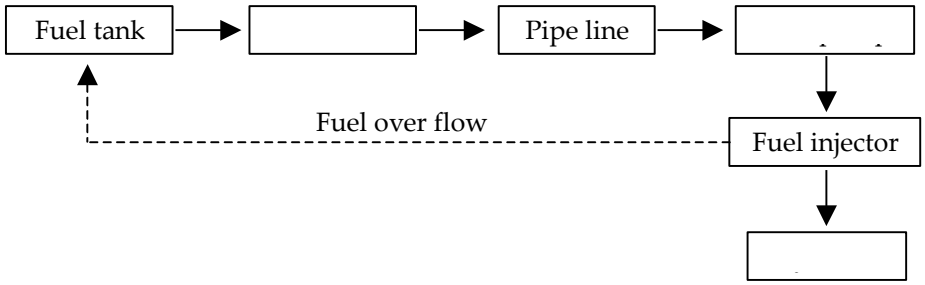
   When the component of the engine is removed, the component should be studied in detail (as much as possible). Sequence to be followed during dismantling is -----

   a. Drain out lubricating oil and water
   b. Remove head cover
   c. Remove fuel line (also disconnect at the injector)
   d. Remove inlet and exhaust manifold
   e. Remove cylinder head cover
   f. Remove rocker arm along with push rod
   g. Remove lub oil line
   h. Remove timer cover
   i. Remove rear cover
   j. Remove piston

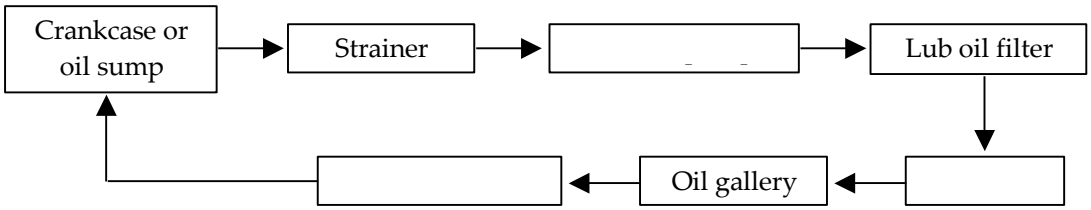
REPORT WRITING

A. Identify the missing components of the following system and briefly state their functions.

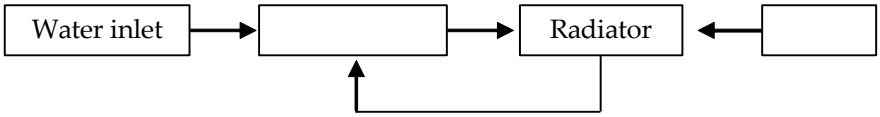
1. Fuel supply system:



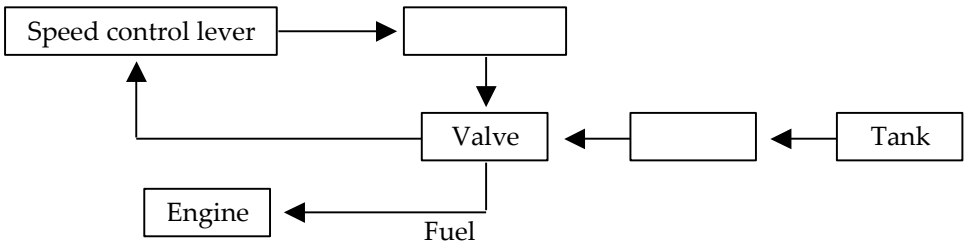
2. Lubrication system:



3. Cooling system:



4. Fuel control system:



B. QUESTIONS

Provide the following information pertaining to your observation in the experiment:

i) No of cylinder rings, their types and functions
ii) No of bearings, their types and functions
iii) No of valves and mention which one was bigger
iv) Location of cooling water pump
v) Fuel injection type no. of holes in each nozzle

C. Discussion:

Discuss the above study and express your comments regarding the experiment.

EXPERIMENT NO. 2(b)

STUDY OF A GRAY MARINE DIESEL ENGINE

1. Complete the details of below.

- Study of a gray marine engine:
- Record name plate data.
- Show schematic diagram of cooling water circuits.
- Note the following features.

– Low Speed & High Torque Requirement of Marine Vessel.

– Two-Circuit Water Cooling System

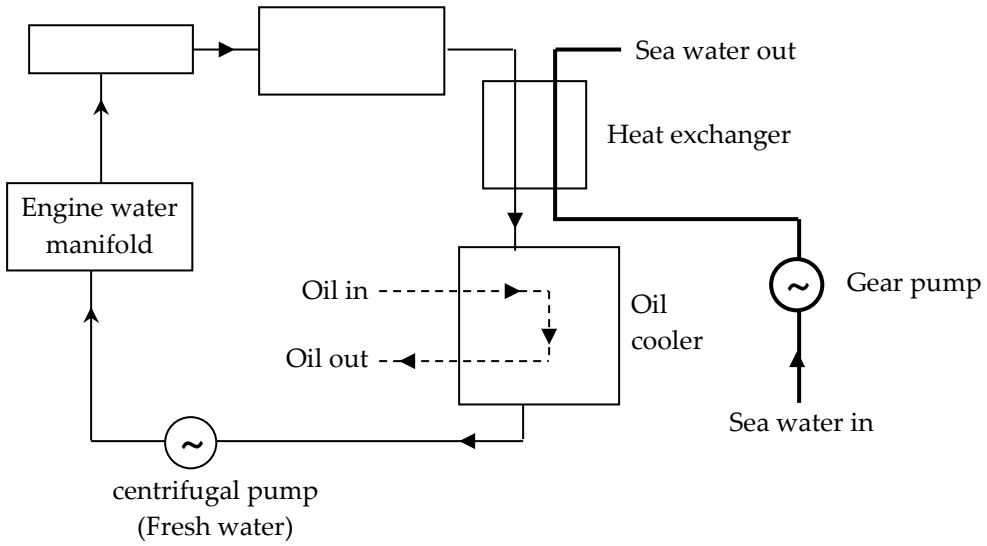
– Number of Strokes per Cycle

– Valve configuration

REPORT WRITING

Identify the missing components of the following systems and briefly state their functions.

1. Cooling water circuit



EXPERIMENT NO. 03

PERFORMANCE TEST OF A PETROL ENGINE AT WIDE OPEN THROTTLE (WOT) CONDITION

DATA SHEET

Engine Specification & Ambient Data:

Brand Name		**Date**			
Model		**Cooling**		**Room Temp.**	
Engine No.		**Silencer/Muffler**		**Dynamometer**	Hydraulic Type
Country of Make		**Lub Oil Filter**		**Dynamometer HP Rating**	
Manufacturer		**Fuel Filter**			
Rated Output		**Air Cleaner**		**Dry Bulb Temp. & Wet Bulb Temp.**	
Rated rpm		**Oil Pressure Indicator**		**Atm. Pressure**	
No. of Cylinders		**Coupling**		**Relative Humidity**	
Lub Oil Grade		**Starting**		**Correction Factors**	As per (BS 5514)
Fuel Used		**Rotation (from fly wheel side)**		α =	β =
Sp. Gr. (SG) (at room temp.)					

Engine Loading Plan:

Rated Power = 20 hp, Rated Speed = ---------- rpm

Rated Load = _____

Speed (rpm)	WOT Load (Kg)

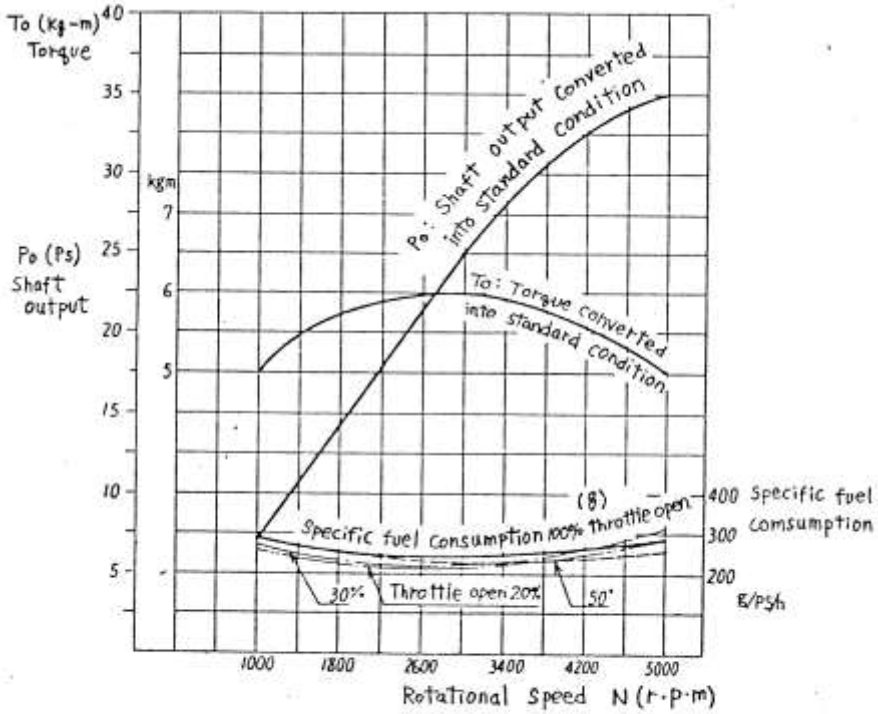


Figure: Performance Curve of a typical engine is shown as example, not for specimen

Engine Performance Data:

Model: **No.:** **hp:** **rpm Control:**

Dynamometer	Shaft Revolution	Fuel Consumption		Lab Condition		B. S. Condition		Temperature		Cooling Water Temp.		
Load W (Kg)	N (rpm)	Amount Collected V (ml)	Time of Collection t (min)	Bhp P (hp)	Bsfc F (gm/bhp-hr)	Bhp P_s (hp)	Bsfc F_s (gm/bhp-hr)	Lub Oil T_1 (^oC)	Exhaust Gas T_e (^oC)	Inlet	Outlet	

Assignments:

i) Plot Power & Torque vs. Speed curve.

ii) Plot Exhaust gas temp. and Lub. Oil temp. vs. Bhp curve.

iii) Write a short note on WOT

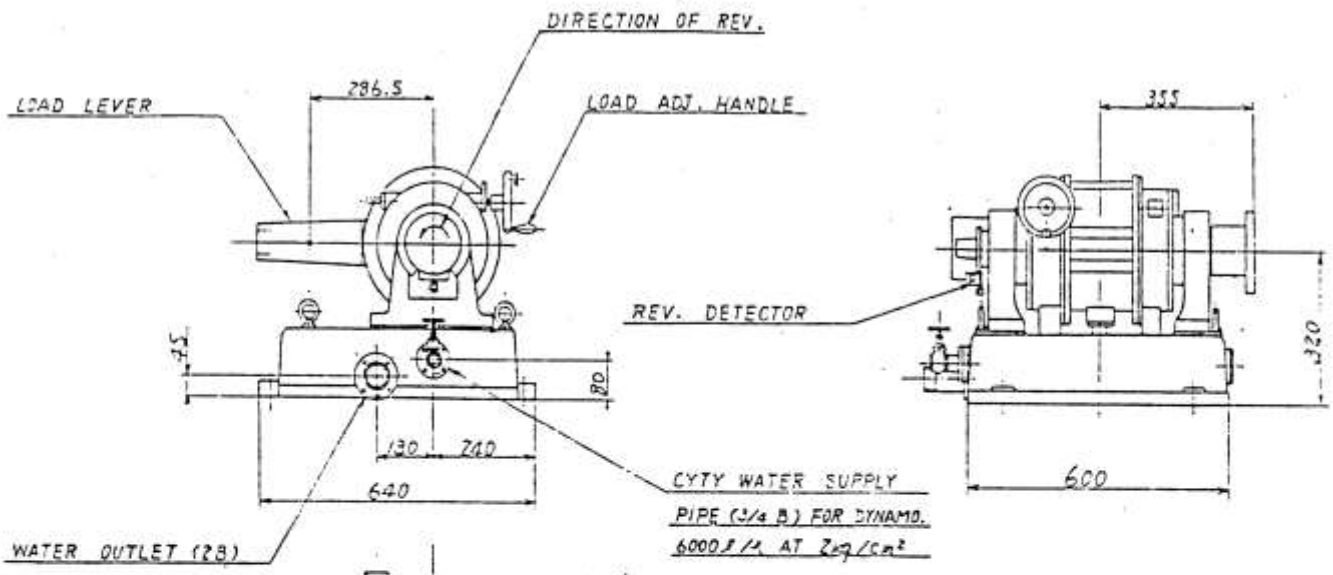
iv) Compare performance under constant speed and WOT condition

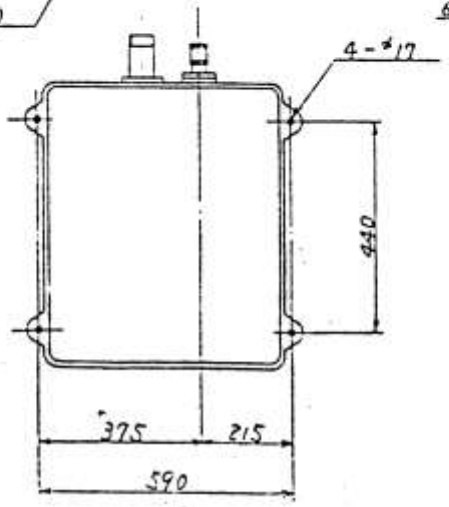
DERATING

Rated (BS) Condition	Lab Condition.
P_r = 100 kPa	P_x =
T_r = 300 ^oK	T_x =
ϕ_r = 0.6	ϕ_x =
ηm = 0.85	
From Annex-F	$\phi_x P_{sx}$
From Annex-E	$(P_x - a \phi_x P_{sx}) / (P_r - a \phi_r P_{sr})$
From Annex-D	$(T_r/T_x)^n$, n = (0.5 SI Engine)
Formula-3 :	$K = (P_x - a \phi_x P_{sx}) / (P_r - a \phi_r P_{sr}) (T_r/T_x)^n$ =
Annex-C :	β =
Annex-B :	α =

Bhp (BS) = Bhp (Lab) / α

Bsfc (BS) = Bsfc (Lab) / β





9. PERFORMANCE DIAGRAM

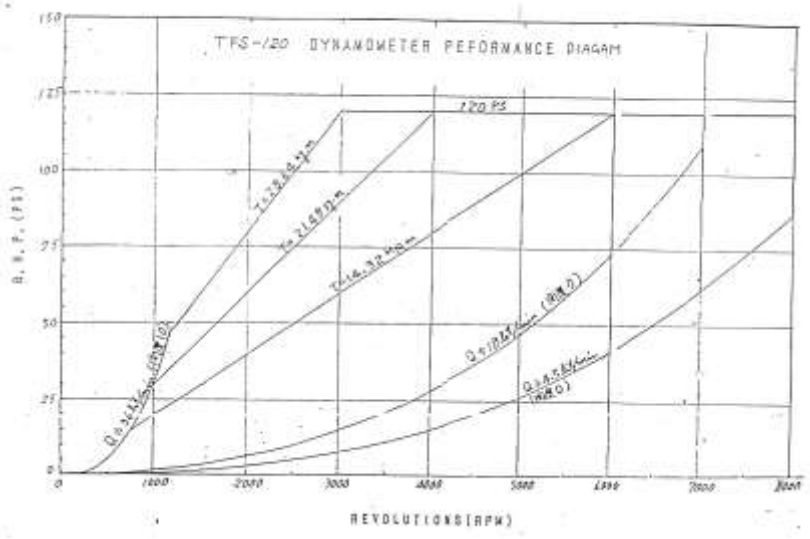
W = kg load
N = rpm
length = 0.2386 m
T = weight × length
= W × g × 0.2386 N-m
1 PS = 735.5 W

$$P(PS) = \frac{2\pi NT}{735.5}\ HP$$

$$= \frac{2\pi}{735.5} \times \frac{N}{60} \times W \times 9.81 \times 0.2386$$

HP

$$= \frac{WN}{3000.64}\ HP \approx \frac{WN}{3000}\ HP$$



EXPERIMENT NO. 04

PERFORMANCE TEST OF A DIESEL GENERATOR ENGINE

DATA SHEET

Engine Specification & Ambient Data:

Brand Name		**Date**	
Model		**Cooling**	
Engine No.		**Silencer/Muffler**	
Country of Make		**Lub Oil Filter**	
Manufacturer		**Fuel Filter**	
Rated Output		**Air Cleaner**	
Rated rpm (Fixed/ Variable)		**Oil Pressure Indicator**	
No. of Cylinders		**Coupling**	
Lub Oil Grade		**Starting**	
Fuel Used		**Rotation (from fly wheel side)**	
Sp. Gr. (SG) (at room temp.)			

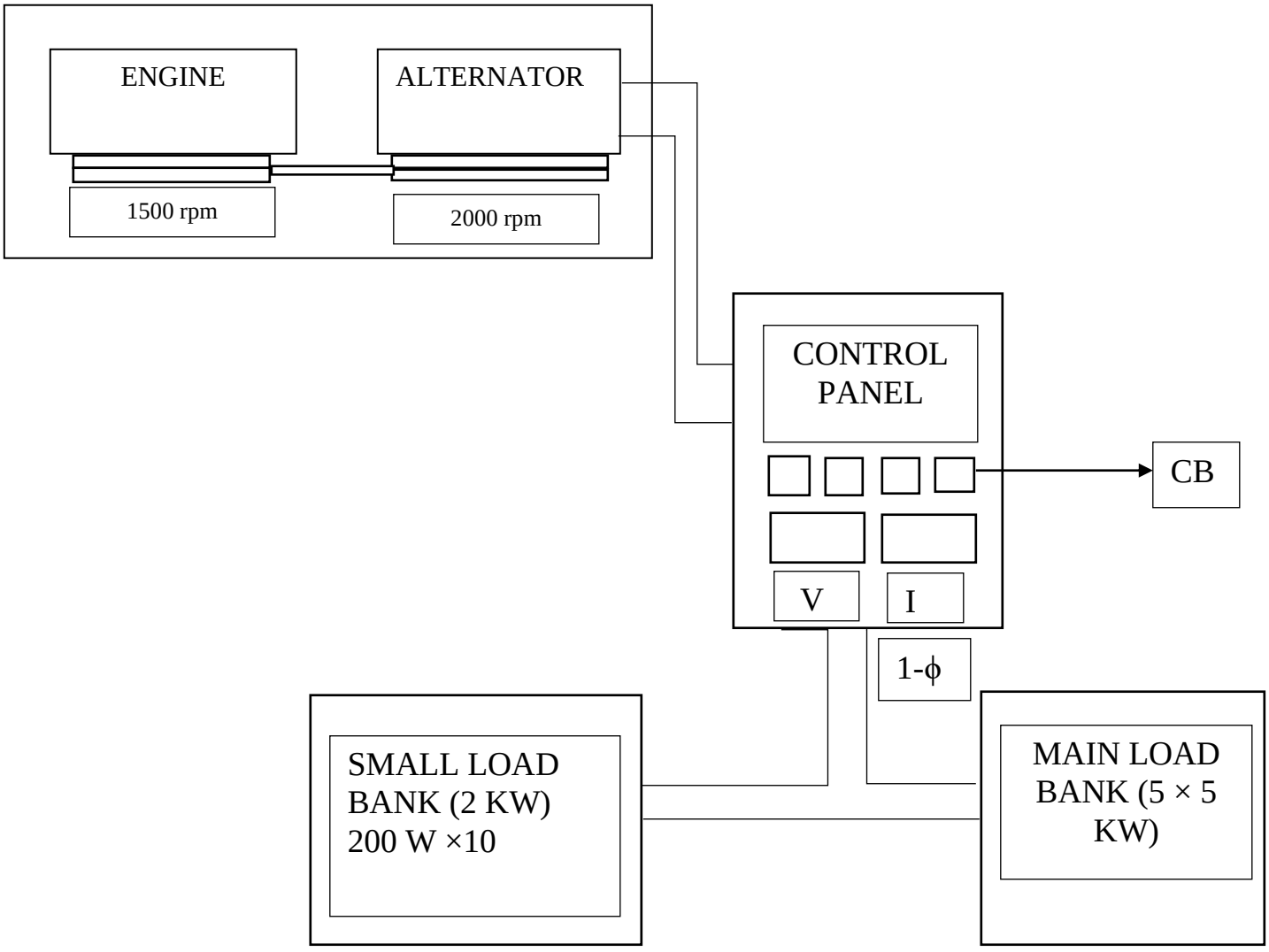
Engine Loading Plan:

Rated Power = ... hp, Rated Speed = ... rpm

Rated Load = ... kg.

% Load	Loading (Kg)
50	
60	
70	
80	
90	
100	
110	

Schematic Diagram of the Setup:



Engine Performance Data:

Model: **No.:** **hp:** **rpm Control:** **[PF = 1]**

Voltage V (Volt)	Current I (A)	Shaft Revolution N (rpm)	Fuel Consumption					Bsfc (gm/kW-hr)	Lub Oil Temp. T_1 (^oC)	Exhaust Gas Temp. T_e (^oC)
			Amount Collected V (ml)	Time of Collection t (min)	Electric Power (kWh)					

Assignments:

i. Plot Bsfc vs. Power (based on Electrical KWe) Curve.

ii. Note, exhaust temperature of CI and SI engines. How are they different and why?

iii. Note, compression ratios of CI and SI engines. How are they different and why?