Data Collection:

Operating speed, N = rpm

Suction pipe dia, d_s = m

Delivery pipe dia, d_d = m

Obs. No.	Manometer reading for discharge, H (mm)	Suction gauge reading, $h_{g,s}$ (m)	Delivery gauge reading, $h_{g,d}$ (m)	Dynamometer Loading (kg)
1				
2				
3				
4				
5				

Calculation:

Manometer reading for Discharge, H = mm (Hg)

Discharge, $Q= 0.586\sqrt{H}$ litre/s

Total head, $H_t =(h_{g,d}+h_{v,d}+h_d)-(h_{g,s}+h_{v,s}+h_s)$

Here, pressure gauge reading in delivery side, $h_{g,d}$ =

pressure gauge reading in suction side, $h_{s,d}$ =

h_d= vertical distance of the pressure gauge in the delivery side from the pump horizontal centerline = Z_d = m

h_s= vertical distance of the pressure gauge in the suction side from the pump horizontal centerline = Z_s = m

Velocity at the delivery side, $V_d = \frac{Q}{\frac{\pi d_d^2}{4}}$

Velocity at the delivery side, $V_s = \frac{Q}{\frac{\pi d_s^2}{4}}$

Total Head, $H_t = (h_{g,d} + \frac{v_d^2}{2g} + h_d) - (h_{g,s} + \frac{v_s^2}{2g} + h_s)$

Input Power, $P_i = N \times (r + l) \times \omega$

$= mg \times (r + l) \times \frac{2\pi N}{60}$

Output Power, $P_o = Q\Upsilon H$

Efficiency, $\eta = \frac{Po}{Pi} \times 100\%$

Calculation Table:

Obs. No.	N (rpm)	Total head, H (m)	Discharge, Q (m^3/s)	Input power, P_i (watt)	Output power P_o (Watt)	Efficiency η

Date of performance:

Objective:

To study the flow rate and head characteristics of two centrifugal pumps in series and parallel connections.

Apparatus:

Schematic Diagram (Connection Circuit):

Pump 2 off and Pump 1 running	**Pump 1 off and Pump 2 running**
Both pumps in series connection	**Both pumps in parallel connection**

Data Collection:

For Pump 2 off Pump 1 running:

No of Obs.	Suction Pressure, $P_{s,1}$		Delivery Pressure, $P_{d,1}$		Total Head (m of H_2O)	Manometer reading			Flow rate, Q (m^3/s)
	inch Hg	m of H_2O	Kg/cm^2	m of H_2O		Left, L (cm)	Right, R (cm)	Net Deflection, ΔH (m)	

For Pump 1 off Pump 2 running:

No of Obs.	Suction Pressure, $P_{s,2}$		Delivery Pressure, $P_{d,2}$		Total Head (m of H_2O)	Manometer reading			Flow rate, Q (m^3/s)
	inch Hg	m of H_2O	Kg/cm^2	m of H_2O		Left, L (cm)	Right, R (cm)	Net Deflection, ΔH (m)	

For Pumps is series connection:

No of Obs.	Suction Pressure, $P_{s,3}$		Delivery Pressure, $P_{d,3}$		Total Head (m of H_2O)	Manometer reading			Flow rate, Q (m^3/s)
	inch Hg	m of H_2O	Kg/cm^2	m of H_2O		Left, L (cm)	Right, R (cm)	Net Deflection, ΔH (m)	

For Pumps is parallel connection:

No of Obs.	Suction Pressure, $P_{s,4}$		Delivery Pressure, $P_{d,4}$		Total Head (m of H_2O)	Manometer reading			Flow rate, Q (m^3/s)
	inch Hg	m of H_2O	Kg/cm^2	m of H_2O		Left, L (cm)	Right, R (cm)	Net Deflection, ΔH (m)	

Calculation:

Suction Pressure, P_s = (inch Hg)

= (m of H_2O)

Delivery Pressure, P_d = (Kg/cm^2)

= (m of H_2O)

Total Head = $P_d - P_s$ = (m of H_2O)

Manometer Net Deflection, ΔH = L + R = (cm)

= (m)

Flow rate, Q = $0.015 \times \Delta H$ (m^3/s) =