

**Instructions: Answer 3/4 ?? out of the 5/6 ?? questions.**

No extra credit will be given for more than 3/4 answers. If more than three-four questions are attempted, CLEARLY indicate which questions are to be graded, otherwise only the first three-four relevant answers will be graded, and the rest ignored. Show all calculation steps to ensure that partial credit is earned, even if the final answer is incorrect. In cases where the answer is obviously wrong, some credit will be given if you identify this as an improbable answer.

Note: All information is given in metric and English units. You may select the units of your choice for each of the questions. **However do NOT use different unit systems within a single question.**

**Power Equations**

$$P = 2\pi TN/60,000$$

$$P_{fe} = M_f * HV / 3600$$

$$P = (MEP * A_e * L * N * n) / (rc * 60. 10^6)$$

$$P = (MEP * D * N) / (rc * 60. 10^3)$$

$$D = A_e * L * n / 1000$$

$$P = 2\pi TN/33,000$$

$$P_{fe} = M_f * HV * 778 / 60 / 33000$$

$$P = (MEP * A_e * (L/12) * N * n) / (rc * 33000)$$

$$P = (MEP * (D/12) * N) / (rc * 33000)$$

$$D = A_e * L * n$$

**Units Conversions**

$$1 \text{ BTU} = 778 \text{ ft.lb of work}$$

$$33000 \text{ ft.lb/min} = 1 \text{ Hp}$$

$$550 \text{ ft.lb/sec} = 1 \text{ Hp}$$

$$1 \text{ gal} = 231 \text{ cubic inches}$$

$$1 \text{ mile} = 5280 \text{ ft}$$

$$1 \text{ kN.m} = 1 \text{ kJ}$$

$$1 \text{ kJ/sec} = 1 \text{ kW}$$

$$1000 \text{ liters} = 1 \text{ m}^3$$

$$1000 \text{ cm}^3 = 1 \text{ liter}$$

$$g = 32.2 \text{ (ft/s}^2\text{)}$$

$$\text{Force (N)} = \text{mass(kg)} * \text{gravity(m/s}^2\text{)} \quad 1 \text{ (N)} = 1 \text{ (kg)} * 9.8 \text{ (m/s}^2\text{)}$$

$$\text{gal} = 3.785 \text{ liters}$$

$$1 \text{ psi} = 6.8948 \text{ kPa}$$

$$1 \text{ inch} = 0.0254 \text{ m}$$

$$1 \text{ ft.lb} = 1.356 \text{ N.m}$$

$$g = 9.8 \text{ (m/s}^2\text{)}$$

$$1 \text{ Hp} = 0.7457 \text{ kW}$$

$$1 \text{ BTU} = 1.0551 \text{ kJ}$$

$$1 \text{ lb force} = 4.45 \text{ Newton}$$

$$\text{ft} = 0.3048 \text{ meters}$$