Uva Wellassa University, Sri Lanka

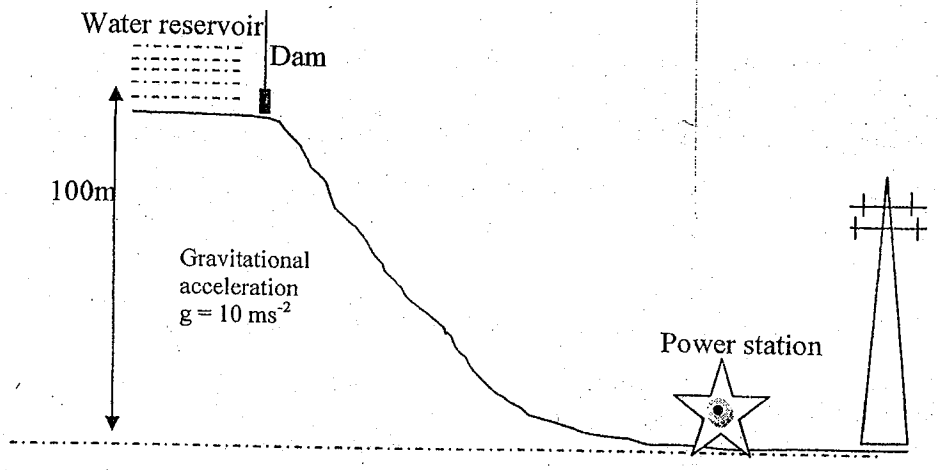
End of the Semester Examination- Second Semester 2007

SCT 102-3 Basic Mathematics and Engineering Technology

Answer for all questions (5 questions)
Time: 2 hours and 30 minutes

Question 01

1. Write down the law of energy conservation.
2. Following figure shows a simple diagram of a hydropower station. Water reservoir lies on the top of the mountain which has 100m height from the ground. By assuming there is no energy loss from reservoir to power station, give answers for following questions.

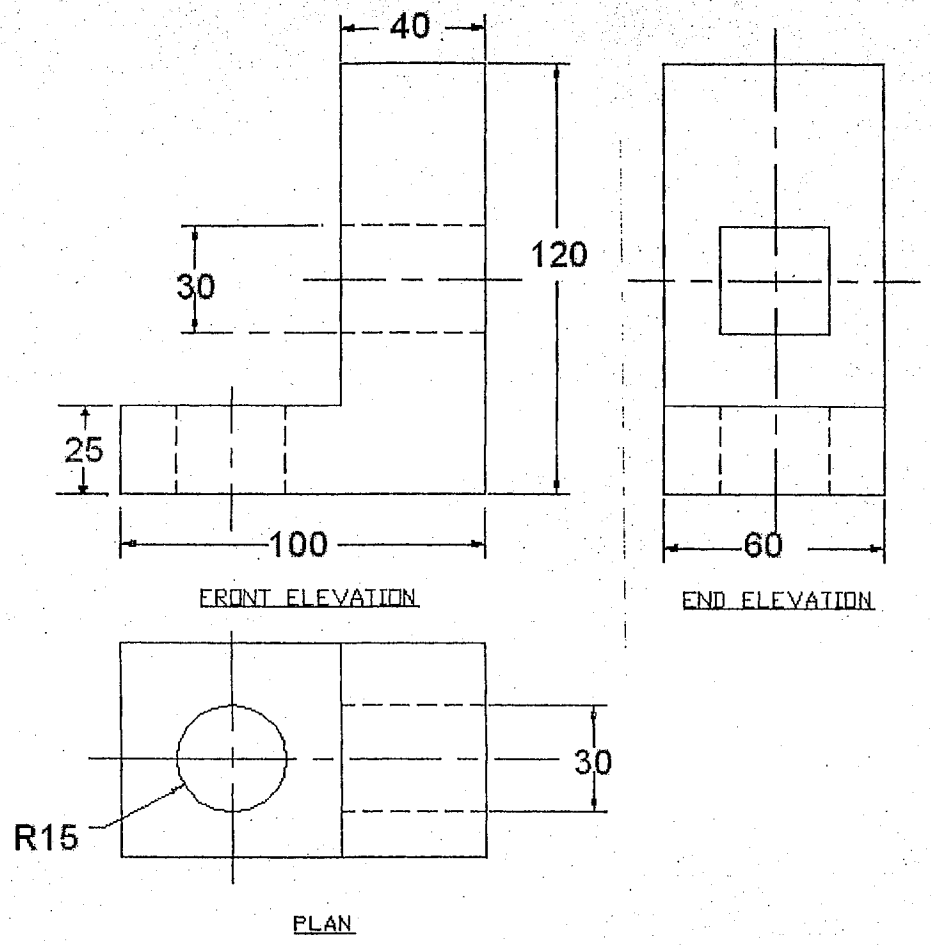


a. State the energy formation of the water on the top of the mountain.
b. How much energy has the one kilogram of water on the top of the mountain?
c. What is the energy formation of the water at the power station?
d. Calculate the velocity of one kilogram of water at the power station.
e. Can we convert total energy of the water in to electricity? Yes/No. Give the reasons.

(100%)

Question 02

(a) The Fig Q.2.a shows the main three orthographic views of a metal made block. Draw the Isometric view (Free hand) of the metal block.



Note: All dimensions are in millimeters

Fig Q.2.a

(50%)

(b) You want to take the following measurements of the metal block.

1. Length (approximately)
2. Hole diameter (precisely)
3. Hole depth (precisely)
4. Square size (precisely)

Mention for each measurement what is the most appropriate measuring equipment by considering you have provided with following measuring equipments.

- Meter ruler
- Venire caliper
- Micrometer screw gauge

(20%)

(c) What is the most suitable method of manufacturing for the above metal block?

(20%)

Question 03

(a) Write short notes on the following topics.

1. Machining process
2. Welding process
3. Casting process
4. Forming and Forging
5. Injection molding

(50%)

(b) What is cleaner production?

(20%)

(c) The paragraph given below describes the **rice making process.** Construct the process flow chart by identifying the main raw material, unit processes and input and out put of each unit processes. Also make the comments about possible cleaner production techniques that can be applied to modify the existing rice making process and to reduce the waste.

Rice Making Process

Wash the rice to make sure it's free of grit and grains. Place in a cooking vessel and add water till the water level above the rice just comes upto the first nuckle in the index finger. Add the salt.
Cover the pot and heat until the grains break easily. If the water evaporates before cooking is complete add a little bit more. If any water is left it can be strained off.
Once the rice has been removed from the fire stir gently. This prevents the rice from hardening once it has cooled.

(30%)

Question 04

(i) Solve the equation $3xe^{-x} + x^2e^{-x} = 0$

(25%)

(ii) Find the mistake in following simplification and explain it.

$$2 < 3$$

$$2\log_{10}\left(\frac{1}{2}\right) < 3\log_{10}\left(\frac{1}{2}\right)$$

$$\log_{10}\left(\frac{1}{2}\right)^2 < \log_{10}\left(\frac{1}{2}\right)^3$$

$$\left(\frac{1}{2}\right)^2 < \left(\frac{1}{2}\right)^3$$

$$\frac{1}{4} < \frac{1}{8}$$

$$2 < 1$$

(50%)

(iii) If $y = 4xe^x$ then find $\frac{dy}{dx}$

(25%)

Question 05

(i) Let the matrices $A=\begin{pmatrix}3 & 2\\ 1 & 4\end{pmatrix}$ and $B=\begin{pmatrix}0 & -1\\ 2 & 1\end{pmatrix}$. Then find

(a) $A+B$

(b) $3B$

(c) AB

(d) A^{-1}

(50%)

(ii) 3kg of oranges and 2kg of apples cost 340 Rupees. 1kg of oranges and 4kg of apples cost 280 Rupees. Find the cost of 1kg of oranges and 1kg apples.

(50%)