NAME Noor-ul-WahaB

ID 12395

Subject Power Generation

Submitted To Eng Sir Sanaullah

Date 24-09-20

Q:No: 01 (A)

Classification of Hydropower plants:

According to Capicity	// to Head	// to Purpose	// to facility types	// to hydrological relaxation	// to transmission System
Large	High	Single Purpose	Run of river	Single	isolated
Medium	Medium	Multi Purpose	Reservoirs	Cascade	connected to grid.
Small	Low		In-Stream		
Mini			Pumped Storage		
Micro					
Pico					

Classification according to Capicity:

- Large : > 100 MW
- Medium: 25 - 100 MW
- Small : 1 - 25 MW
- Mini : 100KW - 1MW
- Micro : 5 - 100 KW
- Pico : < 5 KW

Classification according to Head:

Low Head:-

- Low head hydro-power applications use river current or tidal flows of 30 meters or less to produce energy.
- These application do not need to dam or retain water to creade hydraulic head, the head is only a few meters.
- Using the current of a river or naturally occuring

tidal flow to create electricity may provide a renewable energy source that will have a minimum impact on the environment.

MEDIUM HEAD:-

A power station operating under heads from 30m to 300m.

HIGH HEAD:-

A power station operating under head above about 300m.

A head of 200m / 250m is considered as the limit between medium and high head power station.

Classification according to hydrological Relaxation:-

Single Stage:-

When the run off from a single hydropower plant is diverted back into river or for other purpose other than power generation the set up is known

Cascade System:-

When two or more hydropower plant are used in series such that run off discharge of one hydro power plant is used at the a intake discharge of second hydropower plant such system is called Cascade system.

Classification according to Purpose:-

Single Purpose:-

When whole soul purpose of a project is to produce electricity or irrigation than such project is called Single purpose Hydro power plant.

Multipurpose:-

When water used in hydropower plant project is to be used for other purpose like irrigation, flood control then it is called Multipurpose Hydro power project.

Classification according to facility :-

Storage (Reservoir) type:-

Hydro power plants with storage are supplied with water from large storage reservoir that have been developed by constructing dams across rivers.

Pumped Storage type:-

Type of hydropower plants which utilize the flow of water from a reservoirs at higher potential to one at lower potential.

In-Streame:-

When the velocity of water i.e kinetic energy flowing in the stream is used for conversion into electric power, the system is said In-streame.

Classification according transmission System:-

Isolated:-

Whenever a hydropower plant is set up to in a remote area in order to meet in local demands than such a

hydropower plant is known as Isolated System.

Connected to Grid:-

Whenever the hydropower plant is set up to meet the demands of areas which are at a fair fair distance from plant, Than transmission of power takes Through The grid system.

B Given data:-

Available volume at pondage = V = $5 \times 10^5 m^3$

Available head = h = 100 m

Hydraulic efficiency = 85% .085

Electrical efficiency = 0.94

Therefore : Overall efficiency:

$0.85 \times 0.94 = 0.80$

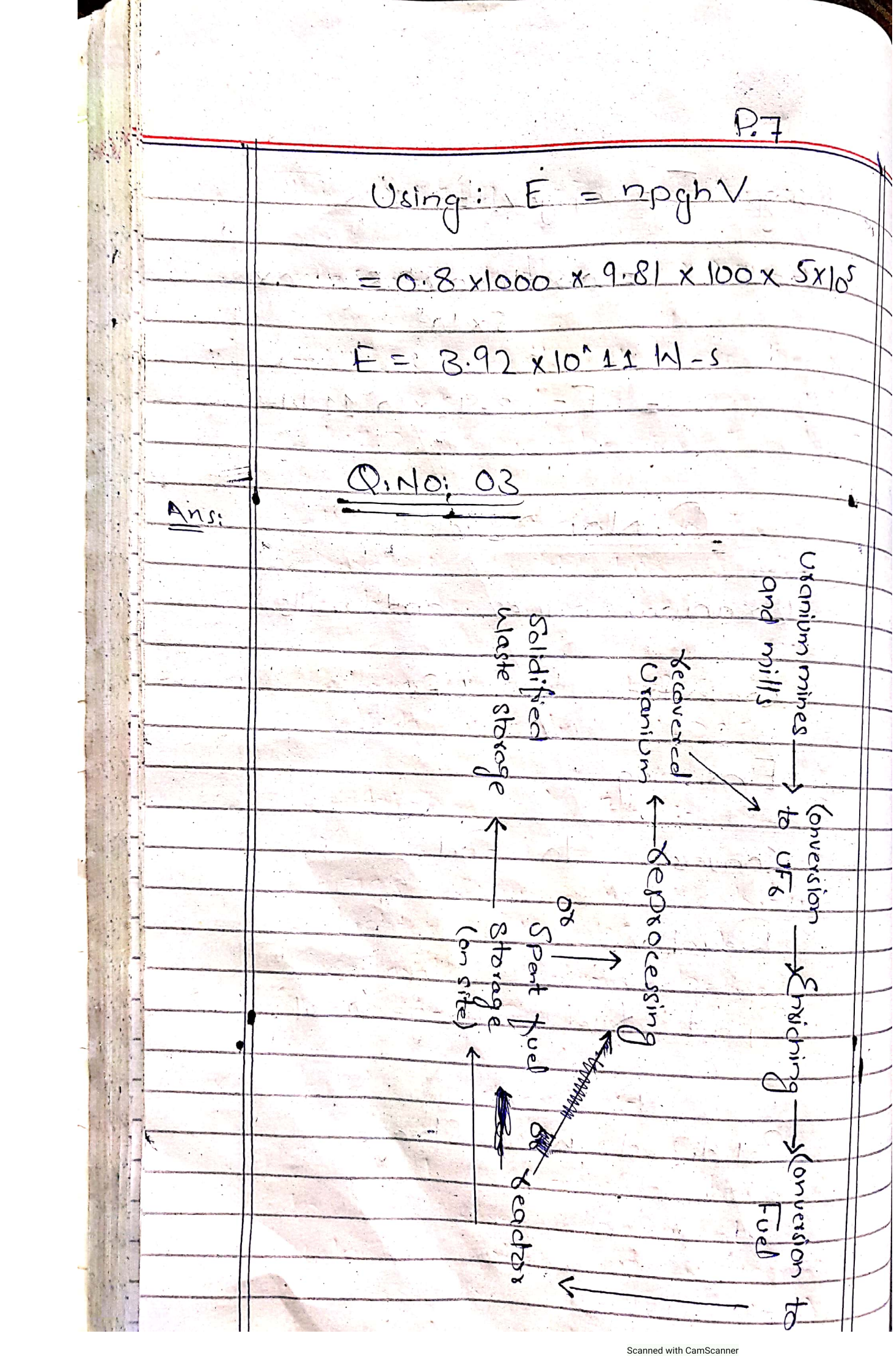
Using: $\dot{E} = \eta \rho g h V$

$= 0.8 \times 1000 \times 9.81 \times 100 \times 5 \times 10^5$

$\dot{E} = 3.92 \times 10^{11}$ W-s

Q.NO: 03

Ans:



Mining and Milling:

Uranium is usually mined by either surface (open cut) or underground mining techniques, depending on the earth depth at which the ore body is found. From these, the mined uranium ore is sent to a mill which is usually located close to mine.

At the mill the ore is crushed and ground to a fine slurry which is leached in sulfuric acid to allow the separation of uranium from waste rock.

Conversion:-

Because uranium needs to be in the form of a gas before it can be enriched, the U_3O_8 is converted into gas uranium hexafluoride (UF_6) at a conversion plant.

* Enriching:-

Need to enrich uranium to at least 3% for a power plant.

- Two Method of Enriching:-
- Gaseous Diffusion Method

- UF_6 (hexaflouride) gas heated
- U-238 is heavier than U-235
- Hexaflouride gas can be separated into two System streams.

: Low velocity U-238
. High velocity U-235

- Centrifuge Method:-

- Gas spun in centrifuge
- Lighter U-235 will separate from heavier U-238

* Fuel Conversion:-

- Enriched Uranium transported to a fuel fabrication plant wher it is converted to uranium dioxide (UO_2) powedex and pressed

into small pellets.
- These pellets are inserted into thin tubes, usually of Zirconium alloy or stainless steel, to form fuel rod
- These rods are then sealed and assembled in clusters.

* The Reactor Core:-

- The reactor core consist of fuel rods and controls rods
  - Fuel rod contain enriched uranium.
  - Control rods are inserted between the fuels rods to absorb neutrons and slow the chain reactions.
- Control rods are made of cardium, which absorbs neutrons effectively.

* Moderator:

Neutrons produced during fission in the core are moving too fast to cause a chain reaction.
- A moderator is required to slow down the neutrons.
- In nuclear power plants water

or graphite acts as the moderator.

* **Uranium Reprocessing:-**

- Spent fuel still contains approximately 96% of its orignal uranium of which the fissionable U-235 content has been reduced to less than 1%.
- Spent fuel comprises waste Product and remaining 1% is plutonium produced while the fuel was in reactor.
- Reprocessing extracts usable fissible U-238
- Most of spent fuel can be reprocessed.
- Fedral law prohibits commercial reprocessing because it will produce plutonium.

* **Nuclear Waste Disposal:-**

- In the U.S, no high-level nuclear waste is ever deposed of... it sits in specially designed pool resembling large swimming pools (water cool the fuel act as a radiation sheild).
- Spent nuclear fuel must be isolated for thousands of years.

Q: NO: 02 (A)

Ans: **Reaction Turbine:-**

A reaction turbine develops power from the combined action of pressure and moving water. The ~~running~~ runner is placed directly in the water steame flowing over the blades rather than striking each individually. Reaction turbines are generally used for sites with lower head and higher flows than compared with the impulse turbines.

Propeller:-

A propeller turbines generally has a runner with three to six blades in which the water contacts all of the blades constantly. Picture a boat propeller runner in a pipe. Through the pipe the pressure is constant; if it is not the runner would be out of balance. The pitch of the blades may be fixed or adjustable. The major

components besides the runner are a scroll case, wicket gates, and a draft tube.

Pelton:-

A Pelton wheel has one or more free jets discharging water into an aerated space and impinging on the buckets of a runner. Draft tubes are not required for impulse turbines since the runner must be located above the maximum tailwater to permit operation at atmospheric pressure.

A Turgo wheel is a variation on the Pelton and is made exclusively by Gilkes in England. The Turgo runner is a cast wheel whose shaped generally resembles a fan blade that is closed on the outer edges. The water stream is applied on one side, goes across the blades and exit on other sides.

Cross-Flow:-

A cross-flow turbine is drum-shaped and uses an elongated, rectangular section nozzel. directed against curved vanes on a cylindrical shaped runner. It resembles a "squirrel cage" blower. The cross flow turbine allows the water to flow through the blades twice. The first pass is when the water flows from the outsides of the blades to the inside; the second pass is from the inside back out. A guide vane at the entrance to the el turbine directs the flow to a limited portion of the runner. The cross-flow was developed to accomodate larger water flows and lower head than the pelton.

* IMPULSE Turbine:-

The impulse turbine generally uses the velocity of water to move

the runner and discharges to atmospheric pressure. The water stream hits each bucket on the runner. There is no suction on the down side of the turbine, and water flows out the bottom of the turbine housing after hitting the runner. An impulse turbine is generally suitable for high head, low flow applications.

Q. No: 2 (B)

Given data:

$h = 190m$

$A = 22 m^2/s$

$\delta = 85\%$

$N_s = 85.49(h)^{0.243}$

Diameter $= 38.56\sqrt{h}/n$

Set diameter $= q = (\pi d_j^2) V_j/4$

$V_j = \sqrt{2gh}$

Inle know that

Diameter $= 38.56\sqrt{h}$ /n

Diameter $= 38.56 \times 16.116$

$D = 625.28896m$

Set diameter $= q_v = (\frac{3}{4} d_j^2) V_j/4$

$q_v = (34 \times 625.288) 6102/4$

$q_v = 29951.7$

Ans