

Sub: **NON CONVENTIONAL ENERGY SOURCES**

Code: 10ME754

Date: 08/09/16 Duration: 90mins Max Marks: 50 Sem: 7<sup>TH</sup>

Branch: Mechanical

Note: Answer all Questions.

- Q.1) Write the short notes on energy production and its reserves of commercial energy sources in India. (10M)
- Q.2) With neat sketches explain the production of crude oil from tar sands and oil shale. (10M)
- Q.3) With a neat sketch explain the production of hydrogen. (10M)
- Q.4) Write the short note on hydrogen transportation. (10M)
- Q.5) Write the short note on hydrogen storage. (10M)

# I<sup>st</sup> IAT - SOLUTION

(1)

## > FOSSIL FUELS:-

### COAL:-

\* The Rate of Production of coal in India over the last 50 years is shown in fig

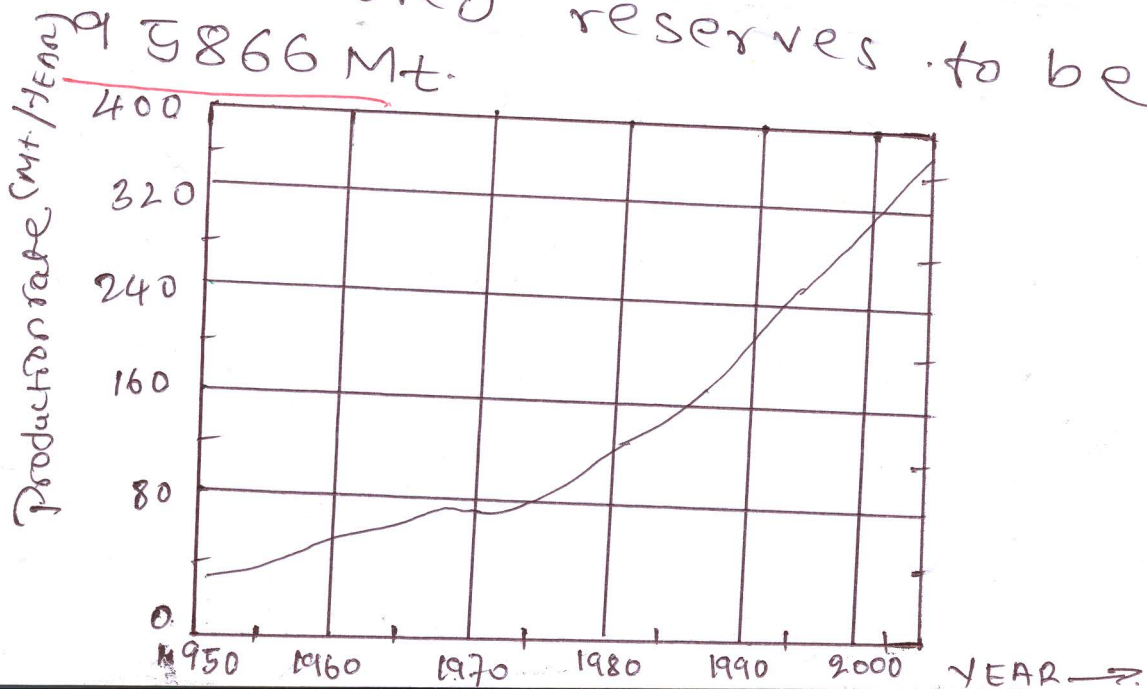
\* It can be seen that there has been an eleven-fold increase in production from 1951 to 2004.

\* Growth rate has been about 4.5% per 2000.

\* In 2000 India's production was 300 Mt, which was about 6.7%.

\* The 2006 estimates given the total reserves to be 253301 Mt

\* The Proved reserves to be 95866 Mt.

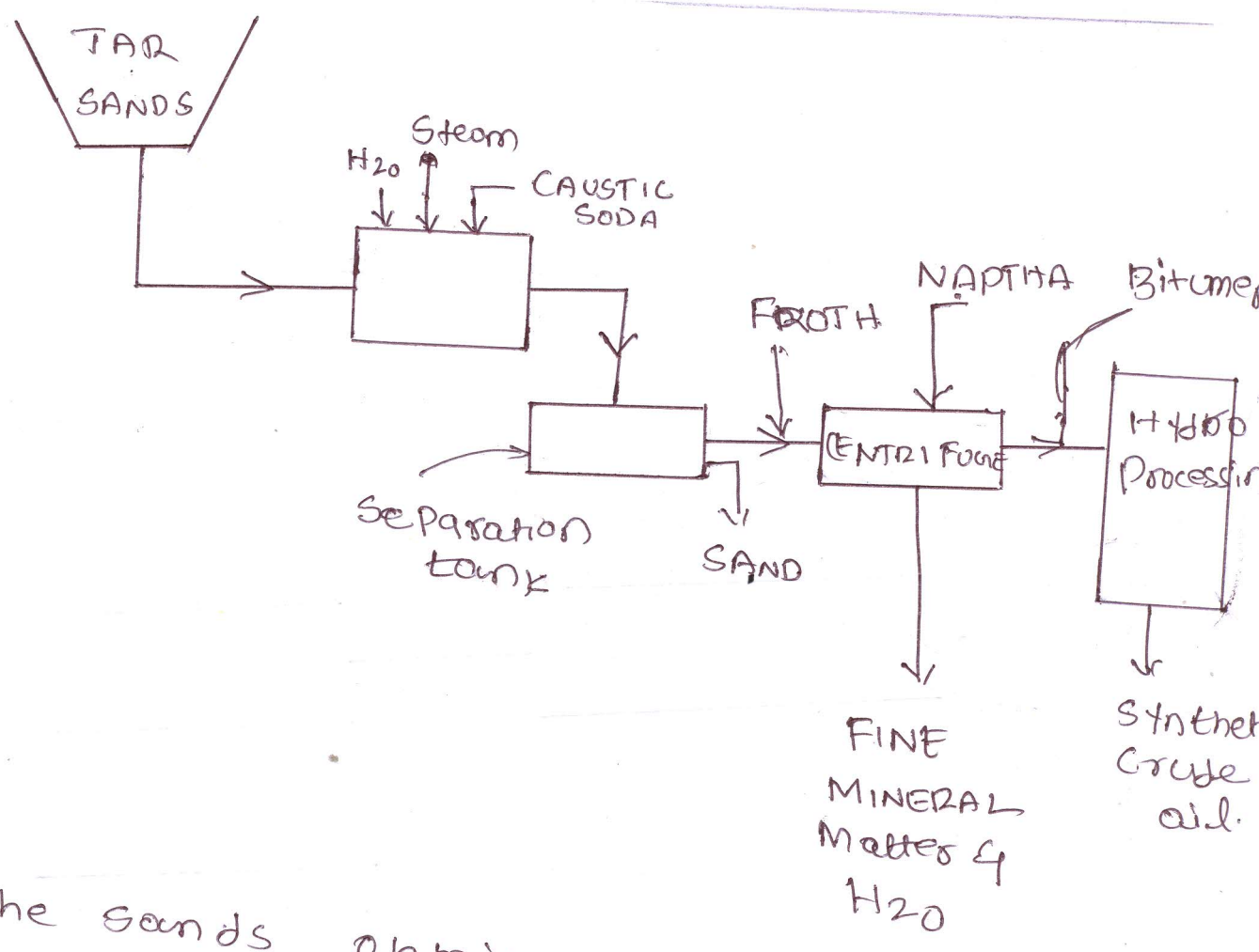


## Water - Power:-

- (\*) Data on the installed capacity of hydroelectric Power in India & the electricity produced from 1947.
- (\*) Installed capacity was only 508 MW at the time of independence.
- (\*) 560 MW at the beginning of the first five year plan in 1951.
- (\*) 1960 The installed capacity has increased at an average rate of about 6.5%.
- (\*) In 2005 installed capacity was 31277 MW.

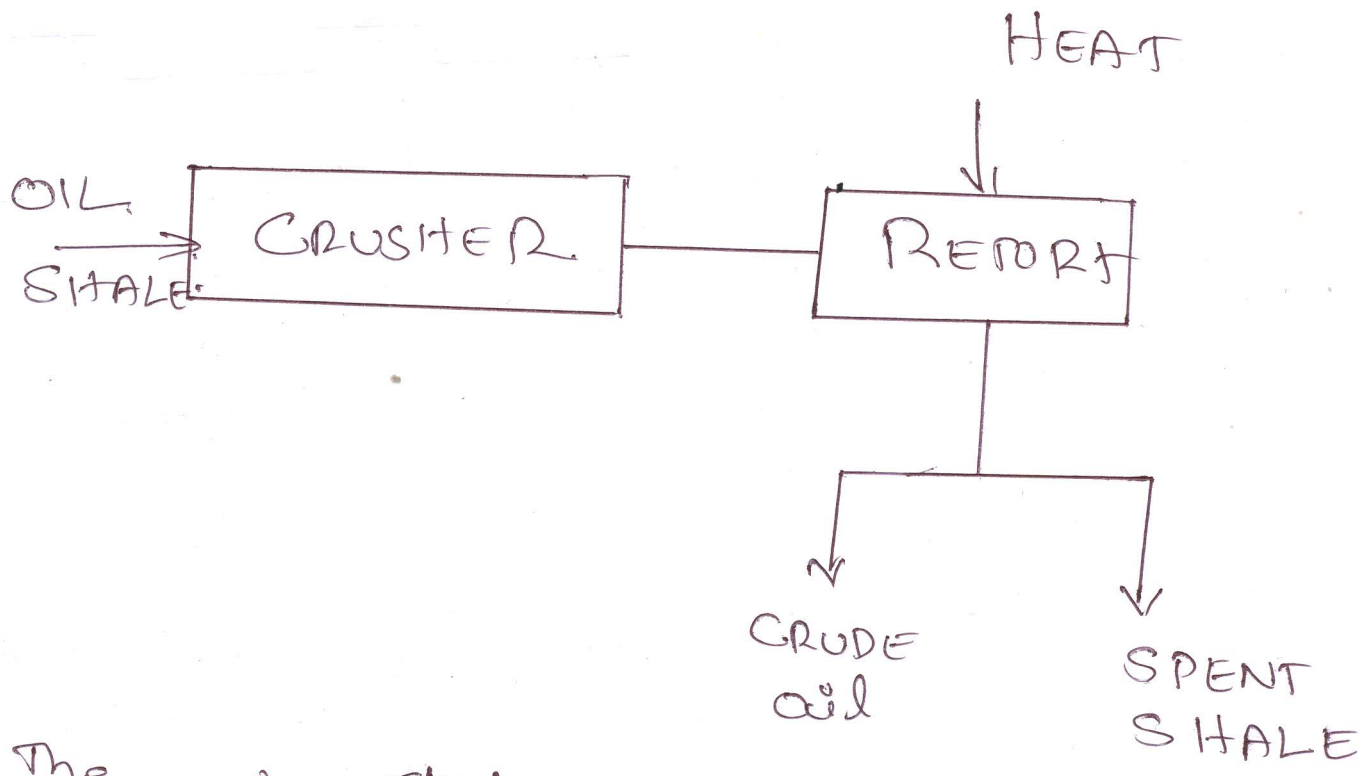


2.



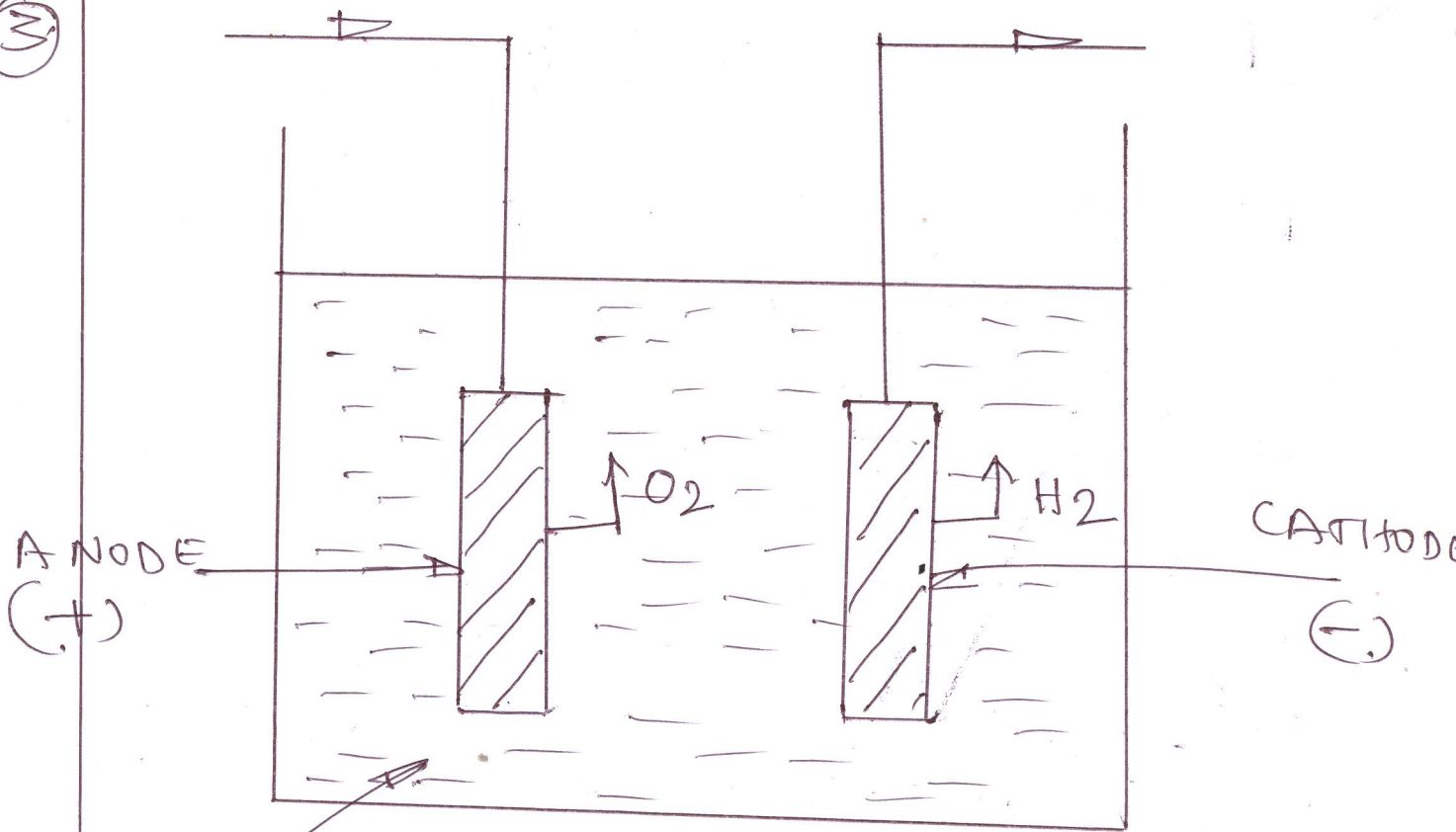
The sands obtained from surface mining are first passed through a conditioning drum, where water, steam & caustic soda are added and a slurry is formed. The slurry is passed into a separation tank where the coarse sand settles at the bottom and a portion of bitumen, water and fine mineral matter form on the top. The froth is diluted with naphtha and subjected to centrifugal action. As a result fine mineral matter and the oil is removed, after this the naphtha is

recovered and recycled, and the bitumen obtained is subjected to hydroprocessing and desulphurisation to produce synthetic crude oil.



The oil shale can be converted to oil. This is done by heating crushed oil shale to about 500°C in the absence of air. Under these conditions, pyrolysis occurs & the kerogen is converted to oil.

3



SIMPLE ELECTROLYTIC CELL  
ELECTROLYTE SOLUTION.

\* The process of splitting water into hydrogen & oxygen by means of a direct electric current is known as electrolysis.

\* Electrolysis cell consists of two electrodes. commonly flat metal (or) carbon plates. immersed in an aqueous conducting solution.



\* A source of D.C. current voltage is connected to the electrodes so that an electric current flows through the electrolyte from ~~±ve~~ +ve -ve electrodes.

\* As a result  $H_2O$  in the electrolyte solution is decomposed into hydrogen gas ( $H_2$ ) & oxygen gas ( $O_2$ ) released at the anode.

\*  $KOH$  solution is required because  $H_2O$  itself is a very poor conductor of electricity.

#### 4. PIPE LINES

① Liquid Hydrogen Transportation

② Metal Hydride Transportation

⑤

1) Compressed Storage

2) Liquid Storage

③ Storage in vacuum insulated  
 (a) Super insulated storage

③ Line Pack System

④ underground storage

5) Storage as metal hydrides