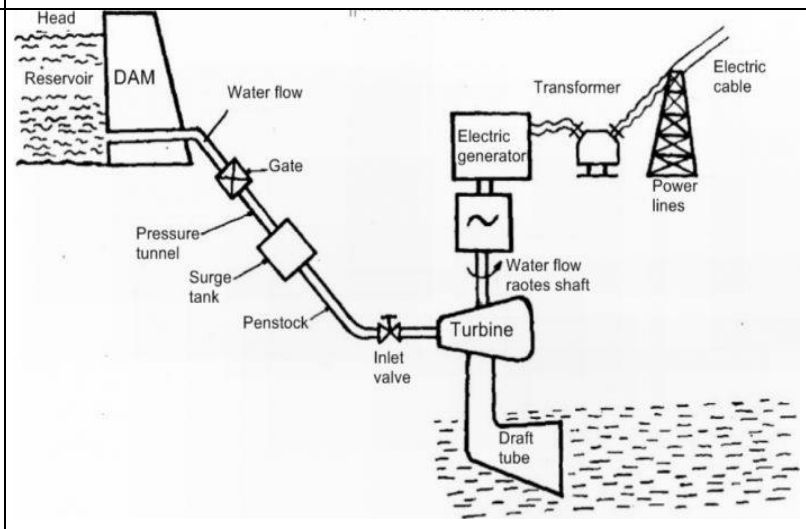
Scoring Indicators model 1

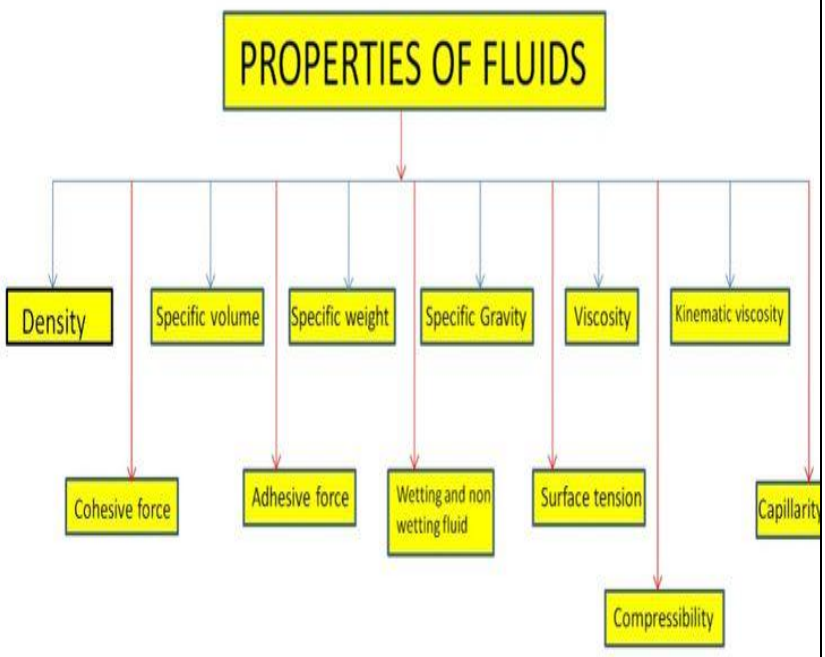
COURSE NAME : MECHANICAL ENGINEERING

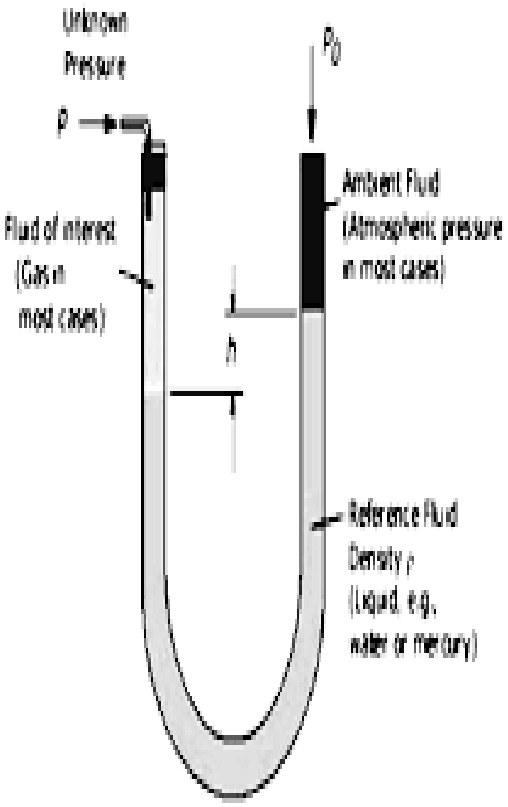
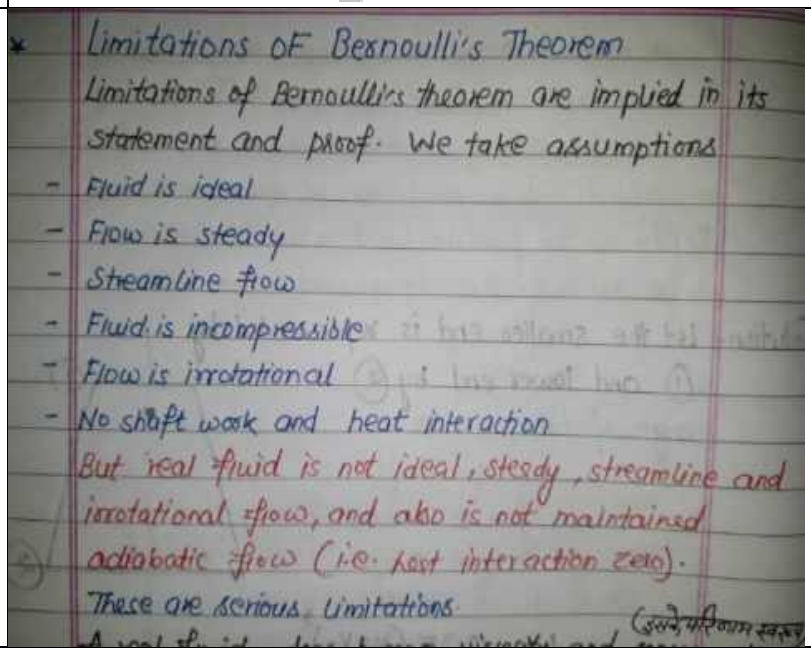
COURSE CODE : 3035 **QID :**

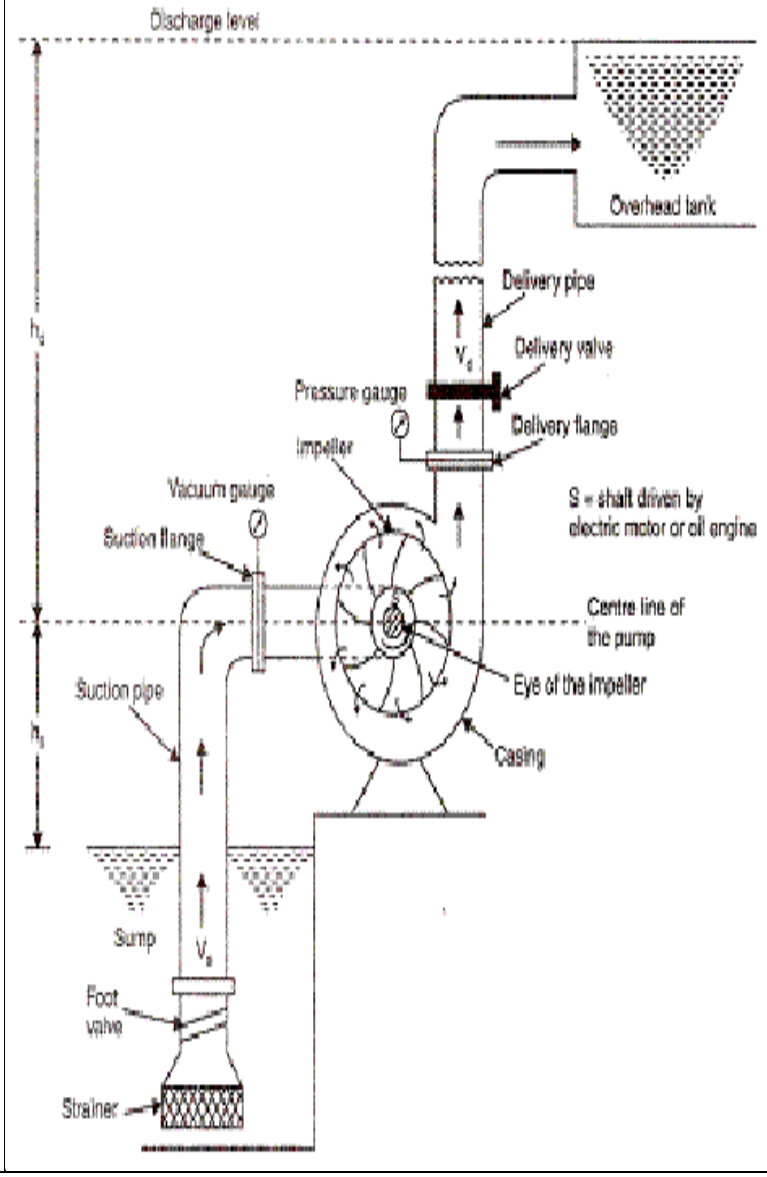
Q No	Scoring Indicators	Splitscore	Sub Total	Total score
	PART A			**9**
I. 1	Weight density	**1**	**1**	
I. 2	Atmospheric pressure and guage pressure	**1**	**1**	
I. 3	Density of given liquid to density of standard liquid	**1**	**1**	
I. 4	Flow of fluid without changing density	**1**	**1**	
I. 5	Reaction turbine	**1**	**1**	
I. 6	Impulse turbine and reaction turbine	**1**	**1**	
I. 7	Steam power plant Steam wash	**0.5*2**	**1**	
I. 8	Distance travel by piston	**1**	**1**	
I. 9	Two stroke	**1**	**1**	
	PART B			**24**
II. 1	Pressure measured by gauge Pressure below atmospheric pressure Absolute pressure is the sum of atmospheric pressure and gauge pressure	**3**	**3**	
II. 2	P = p g h = 0.4*1000 * 9.81 * 30 = 117,720	**1** **2**	**3**	
II. 3	1. Uniform flow: The flow of a fluid is steady if its velocity, pressure and all the numerical values relating to its substance (e.g. density and viscosity) are independent of time at every point in the flow field. 2. Rotational flow: laminar flow, also called streamline flow, type of fluid (gas or liquid) flow in which the fluid travels smoothly or in regular paths. 3. Compressible flow: turbulent flow, type of fluid (gas or	**3**	**3**	

	liquid) flow in which the fluid undergoes irregular fluctuations, or mixing			
II. 4	Diameter of pipe, d = 200 mm = 0.2 m Length of pipe, l = 60m Velocity of flow, v = 2.5 m/s Friction factor, f = 0.005 Chezy's constant, C = 55 By using Darcy's formula Head lost due to friction, $h_f = \frac{4flv^2}{2gd}$ $= \frac{4 \times 0.005 \times 60 \times (2.5)^2}{2 \times 9.81 \times 0.2}$ = 1.911 m of water (*Ans*)	**1** **1** **1**	**3**	
II. 5	AIR VESSEL Closed vessel that stores compressed air HYDRAULIC EFFICIENCY Its defined as power developed by turbine due to its running	**1.5** **1.5**	**3**	
II. 6	N = 900 RPM H = 10M P = 30KW NS = N P / (H ^ 5/4) = 21000 / 17.78 = 1181.1 RPM	**1** **2**	**3**	
II. 7		**3**	**3**	

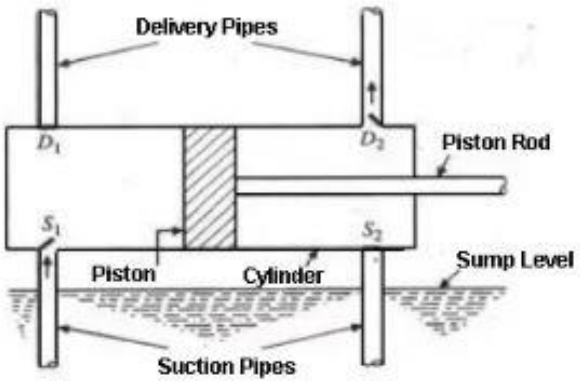
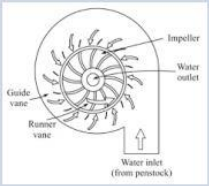
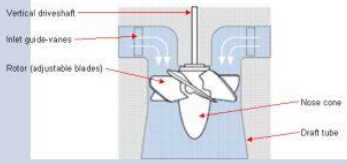
II. 8	STEAM BOILER • Water surrounds tubes • Less number of parts • Slow evaporation • Low steam generation • Generate low pressure steam • Low overall efficiency • Less maintenance cost • Less operation cost • Less skill required to operates the boiler • Used for industrial application • More safe (due to large water content & low steam generation	**0.5*6**	**3**	
II.9	• Thermodynamic cycle used – Otto cycle, diesel cycle, and dual cycle engine • Fuel used – Petrol engine, diesel engine, gas engine, and kerosene oil engine • Number of strokes for completion of cycle – Four-stroke engine and two-stroke engine	**3*1**	**3**	

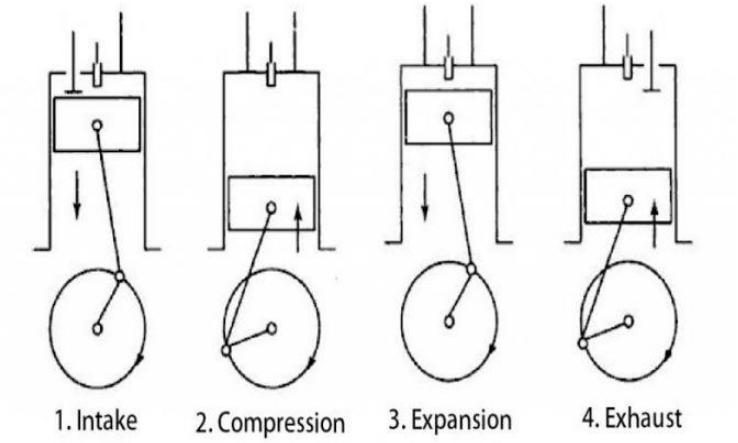
II.10	**Comparison of Four-stroke and two-stroke engine:** **Four-stroke engine** / **Two-stroke engine** 1. Four stroke of the piston and two revolution of crankshaft / Two stroke of the piston and one revolution of crankshaft 2. One power stroke in every two revolution of crankshaft / One power stroke in each revolution of crankshaft 3. Heavier flywheel due to non-uniform turning movement / Lighter flywheel due to more uniform turning movement 4. Power produce is less / Theoretically power produce is twice than the four stroke engine for same size 5. Heavy and bulky / Light and compact 6. Lesser cooling and lubrication requirements / Greater cooling and lubrication requirements 7. Lesser rate of wear and tear / Higher rate of wear and tear 8. Contains valve and valve mechanism / Contains ports arrangement 9. Higher initial cost / Cheaper initial cost 10. Volumetric efficiency is more due to greater time of induction / Volumetric efficiency less due to lesser time of induction 11. Thermal efficiency is high and also part load efficiency better / Thermal efficiency is low, part load efficiency lesser 12. It is used where efficiency is important. / It is used where low cost, compactness and light weight are important. Ex-cars, buses, trucks, tractors, industrial engines, aero planes, power generation etc. / Ex-lawn mowers, scooters, motor cycles, mopeds, propulsion ship etc.	**1.5** **1.5**	**3**	
	PART C			**42**
III.		**2** **2** **2** **1**	**7**	
IV.	This manometer consists of a U shaped tube in which the manometeric liquid is filled. The manometer is used to measure the pressure which is unknown by the balancing gravity force and acceleration due to gravity, g = 9.81 m/sec2 The manometer consists of a steel, brass and aluminum material. It has a glass tube made up of pyralex glass. The graduations are	**2**		

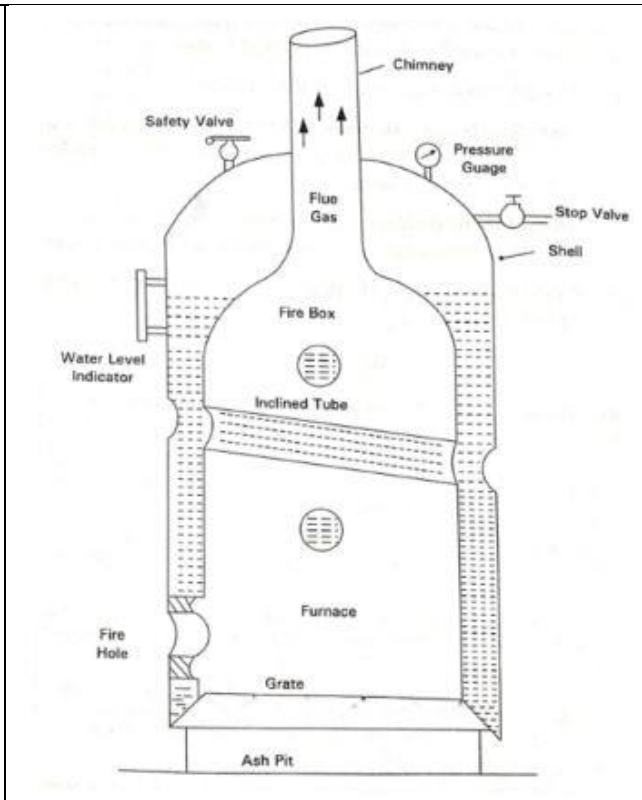
	made on the tube in terms of mm or in some condition it is graduated in kilo Pascal. **Working of U-tube Manometer:** The unknown pressure is applied in the one arm of the tube and the mercury in the tube or manometeric liquid filled in the tube moves in the tube or rises to the constant region and then the movement is stopped. The height of the liquid is measured and noted.  	**2** **2** **1**	**7**	
V.	 Limitations of Bernoulli's Theorem Limitations of Bernoulli's theorem are implied in its statement and proof. We take assumptions - Fluid is ideal - Flow is steady - Streamline flow - Fluid is incompressible - Flow is irrotational - No shaft work and heat interaction But real fluid is not ideal, steady, streamline and irrotational flow, and also is not maintained adiabatic flow (i.e. heat interaction zero). These are serious limitations	**3** **3** **1**	**7**	

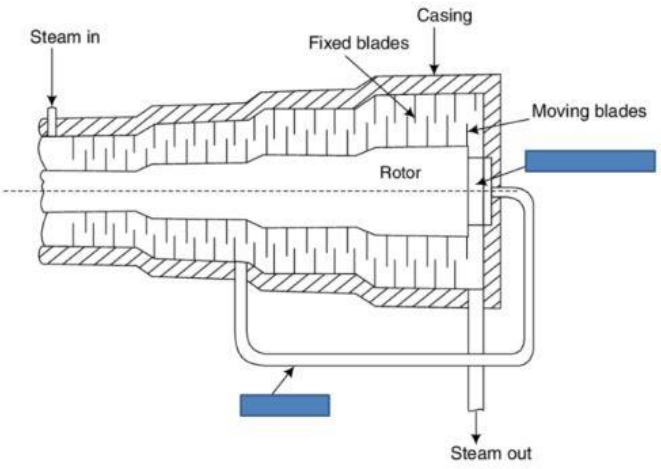
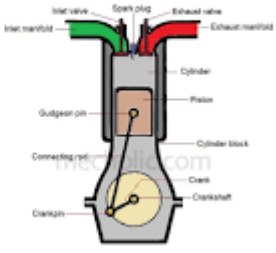
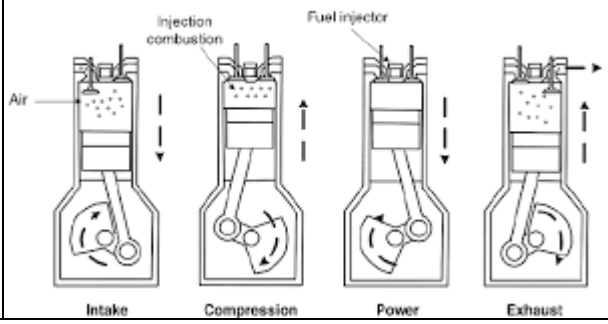
VI.	Water hammer is a phenomenon of sudden rise in pressure in the pipe. It occurs when fluid flowing inside the pipe is suddenly brought to rest by closing a valve in the pipe. water hammer can be eliminated by 1. Gradual closure of valve 2. Sudden closure of valve and considering pipe rigid 3. Sudden closure of valve and considering pipe elastic 4. The length of pipe	**3** **4**	**7**	
VII.		**2** **3** **2**	**7**	

VIII.	In ***Impulse Steam Turbine***, there are some fixed nozzles and moving blades are present on a disc mounted on a shaft. Moving blades are in symmetrical order. The steam enters the turbine casing with some pressure. After that, it passes through one or more no. of fixed nozzles into the turbine. The relative velocity of steam at the outlet of the moving blades is same as the inlet to the blades. During Expansion, steam's pressure falls. Due to high-pressure drop in the nozzles the velocity of steam increases. In a ***reaction turbine***, nozzles will move on bearing in the opposite direction of the steam flow and the pressure is not constant in this turbine. That's why; a reaction force is always applied on the nozzles and tubes. In this turbine steam produces both impulsive and reactive force. So, the resultant force produces to the rotor is the vector sum of impulsive and reactive force and the reaction force is an unbalanced condition. Generally, this turbine is not used for commercial purpose. Due to this reactive force, it is called reaction turbine.	**4** **3**	**7**	
IX.	**A reciprocating pump is also known** a called a positive displacement pump. Because it discharges a definite quantity of liquid. It is often used where a small quantity of liquid is to be handled and where delivery pressure is quite significant. The following are the main **parts of the reciprocating pump.** 1. Cylinder 2. Suction Pipe 3. Delivery Pipe 4. Suction valve 5. Delivery valve 6. Piston and piston rod 7. Crank and connecting rod 8. Strainer 9. Air vessels In this, the water is acting on both sides of the piston as shown in the figure. Thus two suction pipes and two delivery pipes are required for a double-acting pump. When there is a suction stroke on one side of the piston, at the same time there is a delivery stroke on the other side of the piston. Hence for one complete revolution of the crank, there is two delivery stroke and the water is delivered to the pipes by the pump during these two delivery	**4**	**7**	

	strokes  **Double Acting Reciprocating Pump**	**3**		
X.	<table><tr><th>FRANCIS TURBINE</th><th>KAPLAN TURBINE</th></tr><tr><td>Radially inward or mixed flow turbine</td><td>Axial flow turbine</td></tr><tr><td>Medium head turbine</td><td>Low head turbine</td></tr><tr><td>Works under medium discharge</td><td>Works under very high discharge</td></tr><tr><td>Horizontal or vertical position shaft</td><td>Vertical position shaft</td></tr><tr><td>Runner vanes not adjustable</td><td>Runner vanes are adjustable</td></tr><tr><td>Larger no of runner vanes</td><td>Small no of runner vanes used</td></tr><tr><td>Ordinary governors is used</td><td>Heavy duty governors used</td></tr><tr><td>Centripetal type</td><td>Propeller type</td></tr><tr><td>  </td><td>  </td></tr></table>	7*1	**7**	
XI.	A four-stroke or four-cycle engine is an internal combustion (IC) engine, in which four individual cycle of operation is completed by two revolution of the crankshaft or four individual strokes of piston The four separate strokes are listed and described below ; 1. suction (Intake , induction) :- piston travels from top dead center (TDC) to bottom dead center (BDC).Intake valve is Open and exhaust valve is closed. piston pulls air- fuel mixture/fresh air into the combustion chamber by producing vacuum pressure in cylinder through its downward motion. 2. Compression: Piston travels from BDC to TDC. In this	**4**	**7**	

	stroke the piston compresses the air-fuel mixture/fresh air. Both intake and exhaust valves must be closed. 3. Power (combustion , ignition) :- At the end of the compression stroke compressed air- fuel mixture/fresh air is ignited by a spark plug/fuel injector. Piston travels from TDC to BDC. This stroke produces mechanical work from the engine to turn the crankshaft. Both valves are in closed position 4. Exhaust (outlet) :- The piston travels from B.D.C to T.D.C. The exhaust valve opened and intake valve is closed. So that the unwanted exhaust gases ejected out from cylinder to atmosphere  	**3**		

XII.	 CONSTRUCTION 1. BOILER SHELL / DRUM / OUTER CASE – cylindrical in shape, which protect all internal components and also stores water and steam 2. COMBUSTION CHAMBER – Fuel (charcoal/wood/coal...) burnt to produce heat in order to produce steam 3. GRATE – it is a platform inside combustion chamber , upon which fuel is burned 4. FURNACE / FIRE BOX – its the space above grate amd below boiler shell , in which fuel is actually burned 5. CHIMNEY – Passage through which flue gas / exhuast gases eject out 6. MOUNTINGS – devices mounted for proper functioning. A – water level indicators B – pressure guage C – safety valves etc..... 7. ACCESSORIES - devices used additionaly for boiler efficiency A – super heater B – feed pump etc.....	**3** **4**	**7**	

XIII.	 CONSTRUCTION 1. OUTER CASING 2. ROTOR 3. FIXED/GUIDE BLADES – fitted to casing 4. MOVING BLADES – fixed in rotor periphery WORKING • It's a impulse reaction turbine • Superheated steam from boiler enters turine , passes through fixed & moving blades • Pressure decreases due to expansion of steam • Velocity increases in fixed blades & decreases in moving blades • Rotor rotates to produce mechanical work • Exhaust steam goes to condenser through draft tube	**3** **2** **2**	**7**	
XIV.	**Basic components of an IC engine** 1.Cylinder Block 2.Cylinder 3.Piston 4.Combustion Chamber 5.Inlet Manifold 6.Exhaust Manifold 7.Inlet & Exhaust valve 8.Spark Plug 9.Connecting Rod 10.Crankshaft 11.Piston Ring 12.Gudgeon Pin 13.Camsaft  Four-stroke cycle (Diesel) 	**7*1**	**7**	