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COLLEGE OF ENGINEERING PUNE
Department of Mechanical Engineering.
END SEM EXAM

Subject: ETHT (Production) 2012-13 Duration: 3hrs. Max Marks: 50.

Instructions:

- 1) All questions are compulsory.
- 2) Figures to right indicate full marks.
- 3) Wherever necessary support your answers with neat labeled diagrams.
- 4) Assume suitable data where ever necessary. Mention those assumptions clearly.

BEST OF LUCK

Q1			Marks
	a	In an impulse turbine, the mean diameter of the blade is 1.05m and speed is 3000 rpm. The nozzle is at an angle of 18° . The ratio of blade speed to steam speed is 0.42 and the ratio of relative velocity at outlet of blade to that at the inlet is 0.84. The outlet angle of blade is 3° less than the inlet angle. The steam flow rate is 10kg/s. Draw the velocity diagram for the blades and find the following: i) Tangential thrust on blade. ii) Axial thrust on the blade. iii) Power developed.	05
	b	In a Rankine cycle, the steam at inlet to turbine is saturated at a pressure of 35 bar and the exhaust pressure is 0.2 bar. Determine: (i) The pump work, (ii) The turbine work, (iii) The Rankine efficiency, (iv) The condenser heat flow and (v) The dryness at the end of expansion Assume flow rate of 9.5 kg/s	03
	c	Apply steady flow equation to turbine and get the final relation.	02
Q2	a	State the difference between 2-stroke and 4- stroke engines.	02
	b	Explain with neat sketch construction of biogas plant.	03
	c	How is the percentage of carbon calculated from the flue gas analysis. Write in brief.	03
	d	What do you mean by stoichiometric air fuel (A/F) ratio and adiabatic flame temperature?	02
Q3	a	Which are the areas in Internal Combustion Engine where lubrication is required . Explain with neat sketch the splash lubrication system.	05
	b	A four cylinder, 2 stroke cycle petrol engine develops 30kW at 2500 rpm. The mean effective pressure on each piston is 8 bar and mechanical efficiency is 80%. Calculate the diameter and stroke of each cylinder, if the stroke to bore ratio is 1.5. Also calculate fuel consumption of the engine, if the brake thermal efficiency is 28%.The calorific value of fuel is 43900 kJ/kg. (05
Q4	a	A fuel having a chemical formula $C_{12}H_{26}$ is burnt with 50% excess air. Calculate the stoichiometric air required and percentage analysis of products of combustion including water vapor.	05
	b	Classify sources of energy. Write brief on double basin type of tidal energy .How it is different from single basin type?	03
		OR	
	b	With neat sketch explain the construction of flat plate collector used in solar heating. What is range of temperature that is achieved for such flat plate collector	03
	c	State Kelvin- Planck and Clausius statement for second law of thermodynamics.	02

Q5	a	Completely Classify Heat exchangers. With neat sketch explain regenerative types.	05
		OR	
	a	What is effectiveness of heat exchangers? Write note on LMTD	05
	b	<p>Heat transfer or heat transfer</p> <p>A furnace wall is made up of three layers of thickness 250mm, 100mm and 150mm with thermal conductivities of 1.65, k and 9.2 W/m⁰C respectively. The inside is exposed to gases at 1250⁰C with a convection coefficient of 25 W/m²K and the inside surface is at 1100⁰C, the outside surface is exposed to air at 25⁰C with convection coefficient of 12 W/m².⁰C.</p> <p>Determine: 1) The unknown thermal conductivity k, 2) All surface temperature. 3) What will be the % reduction in heat transfer if we include layer of 50mm more of same thermal conductivity.</p>	05