KATHMANDU UNIVERSITY
End Semester Examination
August/September, 2017

Mark Scored:

Level : B.Tech.
Year : III

Course : ENVE 399
Semester : II

Exam Roll No. :

Time: 30 min

F. M. : 20

Registration No.:

Date : SEP 13 2017

SECTION "A"

[15 Q. × 1 = 15 marks]

Tick (√) the best answer(s) or fill in the blanks with most appropriate word/phrase.

1. _____ is the energy received by earth surface per unit time per unit area outside the atmosphere of earth.
   a. Solar Constant
   b. Solar Energy
   c. Thermal Conductivity of sun
   d. Solar value

2. Evacuated heat pipe tubes (EHPTs) are composed of multiple evacuated glass tubes each containing an absorber plate fused to a heat pipe.
   a. Unevaluated heat pipe tubes
   b. Open heat pipe tubes
   c. Evacuated heat pipe tubes
   d. Closed heat pipe tubes

3. On 1905 Einstein describe photoelectric effect and states that emf generated by photon is equal to _____
   a. E = hf
   b. E = 2 hf
   c. E = 3 hf
   d. $E = MC^2$

4. The largest power producing hydropower plant in Nepal at present day is_____
   a. Kulekhani HP
   b. Marsangdi II HP
   c. Chilemi HP
   d. Kaligandaki HP

5. The hydraulic energy of impulse turbine are completely converted into _____ before trans formation in the turbine runner.
   a. Heat energy
   b. Kinetic energy
   c. Potential energy
   d. Mechanical energy

6. There are _____ fault zones along east to west in Nepal.
   a. Five
   b. Four
   c. Three
   d. Two

7. Wind power is extracted from air flow using wind turbines or sails to produce _____ power.
   a. Potential
   b. Kinetic
   c. Mechanical
   d. Lighting

8. _____ is biological material derived from living, or recently living organisms.
   a. Biomass
   b. Biogas
   c. Biofuel
   d. Biostate

9. The most prevalent GHGs is _____
   a. Methane
   b. Nitrous Oxide
   c. Carbonmonoxide
   d. Carbondioxide

10. United Nations Framework Convention on Climate Change made commitments as; _____

a. Parties have differentiated goals and responsibilities.
b. Parties have common but differentiated responsibilities.
c. Parties have same goals and responsibilities.
d. Parties have their own goals and responsibilities.

11. Earth receives _____ of energy from sun.

a. 175 PetaWatts
b. 180 PetaWatts
c. 190 PetaWatts
d. 200 PetaWatts

12. The extractable power from the wind is given by: $P = 1/2\rho AV^3C_p$. In the equation C_p is known as

a. Betz constant law
b. Betz formula
c. Betz limit
d. Betz wind modeling limit

13. Write down the maximum efficiency of the following components of hydropower

a. Turbine _____
b. Penstock pipe _____

14. _____ take super heated water usually at temperature over 200^0C.

a. Binary plant b. Dry plant c. Dual geothermal d. Flash plant

15. The maximum power output of a dam with head of 100 m and a volume flow rate of 1 m^3/sec is _____

SECTION "B"

[5 Q. × 1 = 5 marks]

Define in a sentence.

a. Hybrid Vehicle:

b. Technology:

c. Smart Grid System:

d. Wind Power Factor:

e. Full form of PEMFC:

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SECTION "C"

Attempt *ALL* questions. **Students should attend the questions in serial order.** Assume necessary data with logical explanation.

1. Write down any two adverse and beneficial impacts of solar energy. A family with 5 members plans to install a solar water heater which is mainly used for bath. The hot-water temperature required for bath is 50 °C, while the annual average temperature of cold water is 23 °C. Assuming that each person needs 60 liters of hot water for taking bath a day, how much heat should be provided by the solar water heater to satisfy the family's demand for bath? [3+4]

2. A rural municipality office in Kalikot needs the following electric system: [3+4]
   a. 5 watt 12 V d.c lamp, 10 in numbers to be used for 8 Hrs
   b. VHF telecommunication equipments of system voltage of – 48 V d.c, power consumptions in talk and receive mode (2 hrs/day) is 50 watt, power consumption in standby mode is 10 watt.
   Show all the load calculations in tabular form. Calculate the solar array and battery bank.

3. Calculate the kinetic power produced in a wind turbine at its rated wind speed. Define Beltz constant in the equation. An electricity utility decides to add 50 MW of wind generation to its system. If the individual unit are rated at 3 MW in 40 m/sec wind at a standard condition and have power coefficient of 0.36, use above obtained equation to calculate the required swept area of each rotar and diameter of the rotar? [4+3]

4. Explain the working principle of hydropower with diagram. At a hydropower station, the design is 1.25 times more than the head during monsoon season whereas the design flow discharge and design load are 500 m^3/sec and 56 m respectively. Determine the flood discharge in downstream? [4+3]

5. Define utilization, plant and load factors of a HP. The diameter of penstock in hydropower plant is 2 m having frictional coefficient of 0.054. HP developers wishes to install a penstock pipe having frictional coefficient of 0.032. What will be the diameter of penstock pipe for frictional coefficient 0.032. Assume the discharge and the length for both cases. [3+4]

   Take: head loss (H_L) = $4FLV^2/2gd$

6. Define E Number and CDM. Calculate the heat value of ethanol (C_2H_5OH) in KJ/Kg. using the modified Dulong's formula. [3+4]

7. One HP station and other is thermal power plant of equal power capacity are working at a time in the country. The economic information for both plants are given below. Determine the payback period of additional capital investment in the construction of HP. [4]

	Hydropower plant	**Thermal plant**
Capital cost	7.280 billion	3.43 billion
Annual expenditure	0.291 billion	1.04 billion

8. Calculate the overall density and chemical equation from the waste composition given below. [2+3]

Component	**Mass (kg)**	**Density (kg/m^3)**	**Moisture (%)**	**Calculated dry mass (kg.)**				
				C	**H**	**O**	**N**	**S**
Food Waste	72	330	68	12.672	1.544	8.755	0.461	0.138
Paper	9	90	3	4.016	0.524	3.841	0.026	0.017
Plastic	11	62	6	6.618	0.744	3.257	0.000	0.000
Rubber	3	110	4	1.521	0.346	0.000	0.055	0.000
Wood	3.5	280	18	1.205	0.230	1.234	0.009	0.004
Textiles	1.5	53	19	0.693	0.085	0.365	0.058	0.002

9. Write short notes on (*ANY TWO*): [2+2]
   a. Battery hazards
   b. Impacts of climate change
   c. Relation between energy and HDI