Mark scored :

KATHMANDU UNIVERSITY
End Semester Examination [C]
November, 2018

Level : B. Sc. | Course : PHYS 431
Year : IV | Semester : II
Exam Roll No. : | Time : 30 mins. | F.M. : 20
Registration No.: | Date NOV 19 2018

SECTION "A"
[10 Q. × 1 = 10 marks]

Choose and tick the most appropriate answer.

1. Irradiation (insolation) is defined as
   [a] the incident radiant energy on a surface
   [b] the rate at which radiant energy is incident on a surface
   [c] the incident radiant energy per unit area on a surface over a specified time
   [d] the rate at which radiant energy is incident on a surface per unit area of the surface

2. The terms which describe the position of the sun in the sky are
   [a] hour angle, zenith angle and solar altitude angle
   [b] slope, solar altitude angle and solar azimuth angle
   [c] zenith angle, solar altitude angle and solar azimuth angle
   [d] zenith angle, solar altitude angle and surface azimuth angle

3. Wind has a velocity of 10 m/s and the wind turbine has a diameter of 120 m. If air density is about 1.225 kg/m^3, then the maximum obtainable power density is about
   [a] 181.4 W/m^2 [b] 245 W/m^2 [c] 362.9 W/m^2 [d] 612.5 W/m^2

4. At times near the full moon or new moon, the tidal range is
   [a] exceptionally large and neap tides occur
   [b] exceptionally small and neap tides occur
   [c] exceptionally large and spring tides occur
   [d] exceptionally small and spring tides occur

5. If ρ is the water density, g is the acceleration due to gravity, 'a' is the amplitude, λ is the wavelength and L is the width of the wave perpendicular to the direction of propagation of the wave, then the total energy per unit wavelength from the waves is equal to
   [a] $\frac{1}{2}\rho g a^2$ [b] $\frac{1}{2}\rho g a^2 L$ [c] $\frac{1}{2}\rho g a^2 \lambda L$ [d] $\frac{1}{4}\rho g a^2 \lambda L$

6. The calorific value of anthracite coal is about
   [a] 8600 – 8700 Kcal/kg [b] 8600 – 8700 cal/kg
   [c] 6500 – 7000 Kcal/kg [d] 6500 – 7000 cal/kg

7. H:C ratio in petroleum product is
   [a] less than 0.5 [b] between 0.8 – 1 [c] more than 1 [d] between 1 – 1.75

8. The numbers of protons Z and neutrons N in the missing fragment in the fission reaction ${}_0^1n + {}_{92}^{235}U \rightarrow ..... + {}_{55}^{140}C_s + 4\,{}_0^1n$ are
   [a] Z=55 and N=37 [b] Z=37 and N=55 [c] Z=92 and N=37 [d] Z=37 and N=92

9. In a certain hydropower plant, the discharge is 500 m^3/s and the head is 80 m. If the overall efficiency of the plant is 50%, then the output power of the plant will be
[a] 98 MW [b] 49 MW [c] 98 kW [d] 196 MW

10. The neutral temperature of a thermocouple is defined as the temperature at which
[a] the thermo EMF is zero [b] the thermo EMF is minimum
[c] the thermo EMF is maximum [d] the thermo EMF changes sign

SECTION "B"

[10 Q. × 1 = 10 marks]

Fill in the blanks.

11. At Madison (longitude 89.4°), if the standard time corresponding to longitude 90° then the solar time corresponding to 10:30 AM central time on February 3 is about .....

12. If the average wind power density $\overline{P}/A$ is less than 100 W/m^2, then the wind resource is considered as .....

13. The interior of the earth is thought to consist of a central molten core surrounded by a region of semifluid material called the .....

14. For temperature difference $\Delta T = 20°C$ and warm ocean surface water temperature T_h = 27°C (300K) with $\rho = 1\times10^3$ kg/m^3 and $C = 4.2\times10^3$ J/kg/K, the flow rate required to yield 1 MW of electricity output from an ideal heat engine is about ..... m^3/s.

15. Biochemical conversion (wet processes) takes two forms which are fermentation and .....

16. ${}_1H^2 + {}_1H^3 \rightarrow {}_0n^1 + \ldots\ldots\ldots + Q$

17. In thermonuclear fusion reaction, the Lawson criteria for D-D reaction is expressed as .....

18. Carbon content in bituminous coal is .....

19. In an impulse turbine the sole mechanism of energy conversion is .....

20. In a nuclear fission reactor, if the neutron multiplication factor K is more than 1, then the reactor is said to be in ..... state.

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End Semester Examination [C]
November, 2018

Level : B. Sc.
Year : IV
Time : 2 hrs. 30 mins.

Course : PHYS 431
Semester : II
F. M. : 55

SECTION "C"
[5 Q. × 4 = 20 marks]

1. Discuss the geothermal resources. Draw a schematic diagram of heat extraction from a hot dry rock (HDR) system.

   OR

   Derive the relation between the tidal range and the average power per unit tidal basin area.

2. Draw a schematic diagram of an OTEC system. Discuss the environmental impacts of ocean thermal energy conversion (OTEC) systems.

   OR

   What do you mean by biomass? Discuss the different types of biomass conversion technologies.

3. Write a short note on the environmental impact of the use of fossil fuels.

4. Describe the area-velocity method for the measurement of flow rate of water in a river.

5. Mention the two challenges associated to nuclear fusion. What is magnetic confinement fusion and how does it work?

   OR

   Describe the principle and working of a magneto hydrodynamic (MHD) power generator. What are its main advantages?

SECTION "D"
[5 Q. × 7 = 35 marks]

6. Explain the working principle of operational radiometers. Discuss the estimation of average solar radiation. What is H_o, the day's solar radiation on a horizontal surface in the absence of the atmosphere, at latitude 43° N on April 15? (G_{sc} = 1353 W/m^2)

   OR

   With a labeled diagram, discuss the non-concentrating or flat plate solar energy collector with its applications and advantages. What is the difference between a solar pond and an ordinary homogeneous pond? Explain briefly the construction and working of a solar pond.

7. In case of horizontal axis wind turbines, derive an expression for the maximum power extraction by the Betz limit (criterion).

   OR

   What are the environmental impacts of wind energy systems? With a labeled diagram, discuss the principal subsystems of a typical horizontal axis wind turbine (HAWT).

8. Derive an expression for the power per unit area of the surface from the ocean wave. With a labeled diagram, discuss dolphin-type wave-power machine (wave-energy conversion device).

9. Describe different efficiencies used in hydropower plant. What do you mean by an impulse and a reaction turbine? Outline the differences between the two types of turbines. In a hydroelectric power plant, water flows from a reservoir through a pipe to a turbine 100 m below the dam. If the overall station efficiency is 80% and water flow rate is 1000 m^3/hr, calculate the power output from the station.

10. What is binding energy? What is its importance with reference to nuclear fission and fusion? A nuclear reactor has heat generation rate of 200 MW. How many atoms of U-235 will be needed to be fissioned per second? If the fuel core contains 70 kg of U-235 what fraction should have been used up after 1 month of operation? (Assume that the energy released per fission of U-235 is 200 MeV)

OR

The fusion reaction $2\,{}_1H^2 \rightarrow {}_2He^4 + Q$ is proposed to be used for the production of industrial power. Assuming the efficiency of the process to be 30%, find how many kg of deuterium will be consumed in a day for an output of 50,000 kW. (Given, mass of ${}_1H^2 = 2.014102$ a.m.u. and mass of ${}_2He^4 = 4.002604$ a.m.u.)

KATHMANDU UNIVERSITY

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December 17, 2018

NOTICE

End-Semester Compartmental Examinations of B.E.\B.Sc.\B.Pharm.\B.Tech.\B.Arch. is scheduled accordingly.

Date	Day	Courses
December 26, 2018	Wednesday	PHYS 102, MATH 208, INAN 211, COEG 301, PHYS 313, BIOT 306, CIEG 310, MATH 322, INAN 301, ETEG 304, COMP 307, COMP 409
December 27, 2018	Thursday	BIOL 206, CIEG 208, GEOM 204, COMP 201, CHEG 210, PHAR 214, PHYS 212, ETEG 303
December 28, 2018	Friday	ARCH 112, ENGG 112, CHEM 102, MCSC 202, PHAR 311, CHEG 313, MEEG 306, COMP 314, MGTS 303, MGTS 301, CIEG 308
December 30, 2018	Sunday	ENGT 102, BIOT 207, CHEG 212, CIEG 206, MEEG 206, COMP 204, CHEM 203, EEEG 214, CHEM 212, COMP 315, CIEG 313, COMP 484, PHYS 213
December 31, 2018	Monday	COMP 116, COMP 102, EPEG 318, ETEG 305, BIOT 309, PHAR 313, PHAR 315, MEEG 302, COMP 341
January 1, 2019	Tuesday	MEEG 207,CHEG 211, GEOM 206, BIOT 209, CIEG 207, PHYS 211, COMP 232, COMP 342, MEEG 317, GEOM 319
January 2, 2019	Wednesday	MATH 104, MATH 102, MATH 103, BIOT 208, EPEG 315, MEEG 309, BIOT 308, PHAR 316, COMP 323, CIEG 312
January 3, 2019	Thursday	BIOT 101, CHEG 213, MATH 217, COMP 231, EPEG 301, MEEG 308, COMP 306, COMP 317, GEOM 315
January 4, 2019	Friday	ENVE 101, PHAR 111, BIOT 206, MATH 207, PHAR 212, EEEG 215, MEEG 202, EEEG 309, MEEG 318

Examination Time : 11.00 A.M. to 2.00 P.M.
Venue : Kathmandu University, Dhulikhel.

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November 05, 2018

NOTICE

This is to notify that all the students of School of Engineering and School of Science who have filled up the form for Compartmental and GPA makeup Examinations, November 2018 (notice published on October 25, 2018), the examinations will be held according to the following schedule. (Special Compartl)

Date	Day	Courses
November 15, 2018	Thursday	CHEM 101, COMP 407, EEEG 202, CIEG 405, CIEG 403, PHYS 202, PHYS 421, PHYS 212, CHEM 203, MEPP-412, MCSC -202
November 16, 2018	Friday	EEEG 102, EEEG 207, GEOM 402, CIEG 204, PHYS 213, PHYS 412, ENVE 209, BIOT 202
November 18, 2018	Sunday	COEG 304, EPEG 318, COMP 409, GEOM 411, PHYS 405, PHYS 302, MATH 201, MEEG-206
November 19, 2018	Monday	PHAR 316, STAT 201, PHYS 431, COMP 342

Examination Time : 11.00 A.M. to 2.00 P.M.
Venue : Kathmandu University, Dhulikhel.

Professor PANNA THAPA, PhD
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