OS – 196

V Semester B.Sc. Examination, October/November 2012
(Semester Scheme)
PHYSICS – V
Gravitation, Space Physics and Electronics

Time : 3 Hours Max. Marks : 60

Instruction : *Answer* ***any five*** *questions in Part* ***A***, ***any four*** *in Part* ***B*** *and* ***five*** *in Part* ***C***.

PART – A

Answer **any five** of the following : **(5×6=30)**

1. a) Define gravitational potential at a point.

   b) Obtain an expression for the gravitational potential due to a uniform solid sphere at a point outside the sphere. **(1+5)**

2. a) What is escape velocity ? Explain.

   b) Derive an expression for the escape velocity of a body on the earth. **(2+4)**

3. a) What is relative humidity ?

   b) Outline the vertical structure of the atmosphere. **(1+5)**

4. a) What are hybrid parameters of a transistor ?

   b) Draw an AC equivalent circuit of a CE transistor amplifier and derive expressions for voltage gain and current gain using h-parameters. **(1+5)**

5. a) Define any two JFET parameters.

   b) With the help of a circuit diagram describe the action of a zener diode as a voltage regulator. **(2+4)**

6. a) What is an operational amplifier ? Why is it called so ?

   b) Explain with circuit diagram, how an op-Amp can be used as an integrator. Obtain expression for its output voltage. **(2+4)**

P.T.O.

7. a) What are the essential parts of an oscillator ?

   b) Explain with circuit diagram, the working of a Hartley oscillator. Write the expression for its frequency. **(2+4)**

8. a) What is NOR gate ? Write the truth table for NOR.

   b) With the help of a circuit diagram and truth table, explain the working of a half adder circuit using logic gates. **(2+4)**

PART – B

Solve **any four** problems : **(4×5=20)**

9. A satellite is circling round the earth at a height of 1000 Km above the earth's surface. Calculate the orbital velocity and period of revolution. Given, Radius of the earth = 6,400 Km; $g = 9.8\ ms^{-2}$.

10. In a transistor the base current and the collector current are 100 μA and 2mA respectively. Calculate I_E, α and β of the transistor.

11. In a Colpitt's oscillator, the inductance and capacitances in the tuned circuit are 16 mH, 0.016 μF and 0.018 μF . Calculate the frequency of the oscillator.

12. a) Convert $[675]_8$ to binary.

    b) Convert $[AF.2F]_{16}$ to decimal and binary equivalents. **(2+3)**

13. Prove that

$$(A+B)(\overline{A}\,\overline{C}+C)\overline{(\overline{B}+AC)}=\overline{A}\,B$$

Draw the logic circuit for the output.

14) Find the output of a three input summing op-Amp given the following data

$V_1 = 2V$, $V_2 = 3V$, $V_3 = -1V$

$R_1 = 15\ K\Omega$, $R_2 = 60\ K\Omega$, $R_3 = 600\ K\Omega$, $R_f = 60\ K\Omega$.

Draw the diagram.

PART – C

(5×2=10)

Answer **any five** of the following :

15. a) Saturn is about sixtimes farther from the sun than the Mars. Which of the two planets has (a) longer period of revolution (b) larger orbital speed ?

b) A junction transistor is called a bipolar transistor. Why ?

c) Explain the concept of virtual ground in op-amp circuit.

d) An oscillator is an amplifier with infinite gain. Justify.

e) Does electric field exist across the depletion layer of a semiconductor diode ? Explain.

f) A NAND gate is called a universal gate. Justify.

g) Do gravity waves appear only in water ? Explain.

h) A zener diode is a constant voltage source. Explain.