MS – 269

VI Semester B.Sc. Examination, May/June 2014
(2013-14 and Onwards) (NS)
PHYSICS – VIII
Atmospheric Physics, Electronics and Computational Physics

Time : 3 Hours Max. Marks : 70

Instruction : *Answer* ***five*** *questions from* ***each*** *Part.*

PART – A

Answer **any five** of the following questions. **Each** question carries **eight** marks. **(5×8=40)**

1. a) What are fixed and variable gases ? Explain how they are produced naturally.
   b) Obtain an expression for the variation of pressure with height and give its graphical representation. **(3+5)**

2. a) Explain the emission curves of sun and earth atmosphere.
   b) Derive Beer's law for the absorption of solar radiation by Earth's atmosphere. **(4+4)**

3. a) Distinguish between Eulerian and Lagrangian approaches in atmospheric dynamics.
   b) Obtain an expression for the gradient force and explain the concept of centrifugal force. **(2+6)**

4. a) Explain briefly the fabrication techniques of :
      i) monolithic IC and ii) Thick and Thin film IC.
   b) With necessary theory and circuit diagram explain the action of op-amp as an integrator. **(3+5)**

5. With a neat circuit diagram explain the action of phase shift oscillator. Write the expression for its frequency of oscillation. **8**

6. a) Write the circuit and truth table for exclusive OR Gate.
   b) With the help of circuit diagram and truth table explain the working of half adder circuit. **(4+4)**

7. Write a C-program to find the roots of a linear equation $ax + b = c$. **8**

8. a) Write the algorithm to evaluate $I = \int_a^b f(x)\,dx$ using Simpson's $\frac{3}{8}$ rule.
   b) Write the general format of finding the roots of an equation by Bisection method. **(4+4)**

P.T.O.

PART – B

Answer **any five** of the following questions. **Each** question carries **four** marks. **(5×4=20)**

9. Calculate the adiabatic Lapsrate for the dry atmosphere. Given : mass of the dry air (M) = 29×10^{-3} Kg, R = 8.31 J/mol K, g = 9.8 m/s^2, γ = 1.4 OR C_p = 1000 J/KgK.
10. Calculate the value of the solar constant by using the following data : Earth orbit radius d = 1.5×10^{11} m, radius of the sun = 7×10^8 m, surface temperature of the sun = 5800 K.
11. A rocket of mass 5000 kg is fired vertically upward from a place at the equator, with a velocity of 1200 m/s. If the angular velocity of the Earth is 7.3×10^{-5} rad/s, calculate the Coriolis force acting on it.
12. An amplifier has a gain of 600. When the feedback is applied the gain is reduced to 100. Find the feedback ratio.
13. Find the output voltage of an op-amp inverting adder for the following sets of input voltages and resistors. In all cases $R_f = 1M\Omega$. $V_1 = -3V$, $V_2 = +3V$, $V_3 = +2V$, $R_1 = 250\ K\Omega$, $R_2 = 500\ K\Omega$, $R_3 = 1M\Omega$.
14. Represent the decimal number 284 by its straight binary equivalent. Encode the same decimal number in BCD.
15. Determine the Newtons forward and backward first derivatives of the function f(x) = *l*n(x) at x= 2 using a stepsize of h = 0.01 correct to four decimal places.
16. Using Runge-Kutta method of fourth order, find y(0.2) for the equation

$$\frac{dy}{dx} = \frac{y - x}{y + x},\ y(0) = 1, h = 0.2.$$

PART – C

17. Answer **any five** of the following questions. **Each** question carries **two** marks. **(5×2=10)**
    a) Atmosphere is considered as a heat engine ? Justify.
    b) Greenhouse effect has prevented the Earth from freezing. Explain.
    c) Stratosphere is more comfortable for air craft flying. Why ?
    d) For all practical purposes, the input is assumed to be zero in op-amp circuit. Justify.
    e) Why is binary system preferred to decimal system in digital circuits ?
    f) An oscillator is called an amplifier. Why ?
    g) What is "Break Statement" in C-program ? Explain.
    h) Can Newton-Raphson method be used to find a minimum or maximum of a function. Explain.