

S.Y.B.Sc. (With Credits)-Regular-Semester 2012 Sem IV  
**B.Sc.24122 - Physics-II (Atomic Physics and Solid State Electronics) Paper- II**

P. Pages : 3

Time : Three Hours



**GUG/W/16/5615**

Max. Marks : 50

- Notes : 1. All questions are compulsory.  
2. Draw neat labelled diagrams wherever necessary.

**1. Either**

- a) i) Describe Stern-Gerlach experiment with necessary theory. Discuss its significance. 7  
ii) Determine the maximum separation of a beam of hydrogen atom that move a 3  
distance of 20 cm with a speed of  $2 \times 10^5$  m/s perpendicular to the magnetic field,  
whose gradient is  $2 \times 10^2$  T/m and  $M_H = 1.67 \times 10^{-27}$  kg.  
(Given  $\mu_B = 9.27 \times 10^{-24}$  J/T)

**OR**

- b) i) Define stability factor. 1  
ii) Explain the condition for faithful amplification. 2  
iii) Explain with neat circuit diagram the working of self bias method for stabilization. 4  
iv) Derive an expression for stability factor. 3

**2. Either**

- a) i) Explain how MOSFET differ with FET. 2  
ii) Explain the construction and working of P-channel enhancement MOSFET. 5  
iii) In case of JFET,  $V_{GS} = 0V$ ,  $V_{DS} = 7V$ ,  $I_D = 10mA$ . Now for  $V_{GS} = 0V$ ,  $V_{DS}$  is 3  
changed to 15v, due to which  $I_D$  becomes 10.25mA. In the second state  $V_{GS}$  is  
change changed from 0 to 2V at  $V_{DS} = 15V$  and drain current changes to 9.65mA.  
Determine  
a)  $r_d$       b) gm and    c)  $\mu$

**OR**

- b) i) Explain the working of a difference amplifier with the help of circuit diagram. 4  
ii) Derive an expression for output voltage. 2  
iii) Explain why needed dual power supply for OP-AMP. 2  
iv) A difference amplifier has a difference mode gain 100 and CMRR = 100. Calculate 2  
the output voltage if the inputs are  $V_1 = 1mV$  and  $V_2 = 0.9mV$ .

**3. Either**

- a) Explain magnetic quantum number. 2½
- b) In a transistor circuit the emitter and collector currents are measured as 5mA and 4.9mA respectively. Calculate  $\beta$  of the transistor. 2½
- c) Define FET parameters and write the relation between them. 2½
- d) Explain the working of two stage RC coupled CE amplifier. 2½

**OR**

- e) Explain space quantisation on the basis of vector atomic model. 2½
- f) Compare the areas and doping levels of the different regions of transistor. 2½
- g) Calculate the voltage gain of a common source JFET amplifier having transconductance  $2500 \mu \text{ mho}$  and load resistance  $5\text{k}\Omega$ . 2½
- h) Explain the working of class A amplifier graphically. 2½

**4. Either**

- a) Explain spinning of electron on the basis of vector atomic model. 2½
- b) Explain the working of PNP transistor. 2½
- c) What are advantage of FET over BJT. 2½
- d) A non-inverting amplifier has input resistance of  $10\text{k}\Omega$  and feedback resistance of  $20\text{k}\Omega$ . Calculate the output voltage if the input voltage is 0.5 volt. 2½

**OR**

- e) Name the four quantum numbers of an electron and explain principle quantum number. 2½
- f) Explain the output characteristic of transistor in CE mode. 2½
- g) Derive an expression for voltage gain of common source amplifier. 2½
- h) Explain OP-AMP use as a summing amplifier. 2½

**5. Attempt any ten questions from the following.**

- a) What is Zeeman effect? 1
- b) State Pauli's exclusion principal. 1
- c) What is L-S coupling? 1
- d) For a given transistor  $\beta = 50$ , calculate its  $\alpha$ . 1

- e) What is heat sink? 1
- f) Define current gain in CB mode. 1
- g) Draw circuit symbol of n-channel and p-channel depletion MOSFET. 1
- h) Write the application of JFET. 1
- i) Why does a MOSFET have very high input impedance? 1
- j) What is open loop voltage gain? 1
- k) Write two characteristic of ideal OP-AMP. 1
- l) What is an oscillators? 1

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