

T.Y.B.Sc. (with Credits)-Regular-Semester 2012 Sem VI  
**B.Sc. 4537 - Physics : Paper- II (Fibre Optics, Communication and  
Digital Electronics)**

P. Pages : 3

Time : Three Hours



**GUG/W/16/5654**

Max. Marks : 50

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- Notes : 1. All questions are compulsory.  
2. Draw well labelled diagram wherever necessary.

**Either**

1. a) i) Explain the structure of an optical fibre. 2
- ii) Distinguish between single mode step index and multimode step index fibre. 3
- iii) What are different types of losses in optical fibre? 3
- iv) The optical power, after propagating through a fibre that is 450 m long is reduced to 30% of its original value. Calculate the fibre loss in dB/km. 2

**OR**

- b) i) What is frequency modulation? Obtain an expression for the frequency modulated wave? 5
- ii) Find the carrier and modulating frequencies, modulation index and the maximum deviation for the FM wave given by  $e = 15 \sin(6 \times 10^8 t + 5 \sin 1250 t)$   
What power will this wave dissipate in a 10 ohm resistance? 3
- iii) What are demerits of frequency modulation? 2

**Either**

2. a) i) Convert  $(25.625)_{10}$  into its Binary equivalent. 2
- ii) Perform the following subtraction using 2's complement 5  
a)  $(59)_{10} - (38)_{10}$                       b)  $(11000)_2 - (100)_2$
- iii) Define bit, Nibble and Byte. 3

**OR**

- b) i) Draw the circuit of JKMS flip flop and explain its operation. 4
- ii) What are shift registers? Draw the circuit of 4 bit SISO shift register & explain its operation. 6

**Either**

3. a) State the conditions of total internal reflection in an optical fibre. 2½
- b) Obtain an expression for percentage modulation of AM wave. 2½
- c) Convert  $(D7A5)_{16}$  into decimal number. 2½
- d) Draw the circuit of monostable multivibrator and explain its working. 2½

**OR**

- e) Obtain an expression for acceptance angle of an optical fibre. 2½
- f) How many broadcast stations can be accommodated in a 6MHz bandwidth? Assume the Bandwidth of 10KHz for each AM station. 2½
- g) Construct the basic gates by using universal NAND gate. 2½
- h) Draw the circuit of 4 bit synchronous counter and explain its working. 2½

**Either**

4. a) Calculate NA, acceptance angle and critical angle of the optical fibre having core and cladding refractive indices  $\mu_1 = 1.5$  and  $\mu_2 = 1.45$  respectively. 2½
- b) Distinguish between frequency modulation & amplitude modulation 2½
- c) State and prove any one De Morgan's Theorem. 2½
- d) Explain the working of RS flip flop using NOR Gate and give its truth table. 2½

**OR**

- e) What are application of fibre optics? 2½
- f) Obtain an expression for output power of an A.M. wave in terms of carrier power and modulation index. 2½
- g) What is Full subtractor ? Give its truth table. 2½
- h) In astable multivibrator circuit,  $R_1 = R_2 = 10k\Omega$  and  $C_1 = C_2 = 0.01\mu F$ . Find frequency of oscillations. 2½

5. Solve **any ten** of followings.

- a) What are the major parts of Fibre optic communication system? 1
- b) What is Bandwidth - distance product (BDP)? 1
- c) Define numerical aperture. 1

- d) What is significant Sideband term? **1**
- e) Give importance of modulation factor? **1**
- f) What is Phase modulation? **1**
- g) What do you mean by weighted Binary codes? **1**
- h) Draw the logic diagram for Boolean Equation by using basic Gate.  
 $Y = A\bar{B} + \bar{A}B$  **1**
- i) Draw logic symbol & truth table of NAND Gate. **1**
- j) Why is a Bistable multivibrator called a Flip- flop circuit? **1**
- k) Draw a logic symbol of JKMS Flop-flop. **1**
- l) What are the two basic types of counter? **1**

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