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**RV COLLEGE OF ENGINEERING®**  
 (An Autonomous Institution affiliated to VTU)  
 I / II Semester B. E. Examinations April 2021

**Common to All Branches**

**BASICS OF ELECTRONICS ENGINEERING**

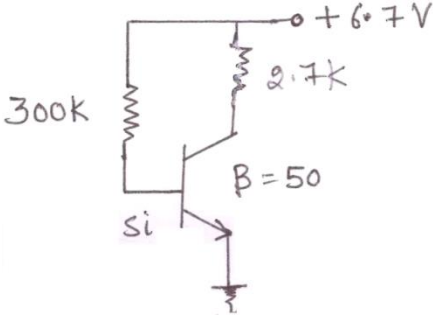
Time: 03 Hours

Maximum Marks: 100

**Instructions to candidates:**

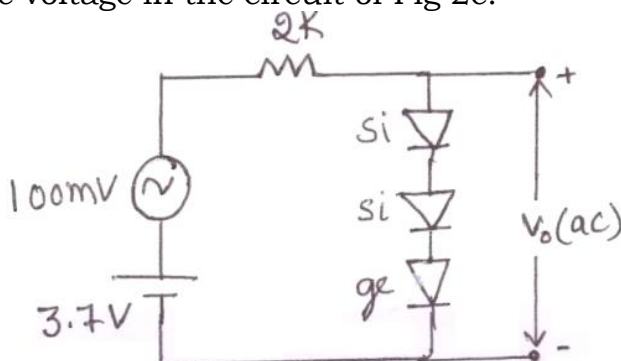
1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6

**PART-A**

|   |      |   |    |
|---|------|---|----|
| 1 | 1.1  | Simplify the following logic expression using Boolean postulates:<br>$Y = (A + B)(\bar{A} + \bar{B})$   | 01 |
|   | 1.2  | The number of basic gates required to realize 1:4 demultiplexer is _____.   | 01 |
|   | 1.3  | The maximum power which can be dissipated at $80^{\circ}\text{C}$ in a diode having maximum power dissipation of $1\text{W}$ at $25^{\circ}\text{C}$ with a derating factor of $5\text{mW}/^{\circ}\text{C}$ is equal to _____. | 01 |
|   | 1.4  | The dynamic resistance of a Si diode at $57^{\circ}\text{C}$ is $14.3\Omega$ . The dc forward current through the diode is _____.   | 01 |
|   | 1.5  | The output voltage of a DC power supply drops from $14\text{V}$ to $13.7\text{V}$ when the input voltage reduces by 10%. The line regulation is _____.  | 01 |
|   | 1.6  | The ac input to a full wave bridge rectifier is $100 \sin \omega t$ . The reverse breakdown voltage capability required for diodes used in the above rectifier = _____.   | 01 |
|   | 1.7  | In a transistor, if $\beta$ changes from 99 to 199, then $\alpha$ changes from _____ to _____.  | 01 |
|   | 1.8  | In the circuit of Fig 1.8, $I_C =$ _____ and $V_{CE} =$ _____.  |    |
|   |      |  <p>Fig 1.8</p>   | 02 |
|   | 1.9  | In a common emitter amplifier circuit, the dc emitter current is $0.25\text{mA}$ and the collector resistance is $2.6\text{k}\Omega$ . The voltage gain of the amplifier is _____.  | 01 |
|   | 1.10 | The gain of an RC coupled amplifier decreases at low frequencies because of _____.  | 01 |
|   | 1.11 | An n-channel enhancement MOSFET having $V_t = 0.5\text{V}$ , $K = 2\text{mA}/\text{V}^2$ is biased such that $V_{gs} = 2\text{V}$ and $V_{ds} = 1\text{V}$ , its $I_D =$ _____.   | 01 |

|      |  |    |
|------|--|----|
| 1.12 | An amplifier has its open loop and closed loop voltage gains as $46dB$ and $40dB$ respectively. The feedback factor is equal to _____%.  | 01 |
| 1.13 | In an $RC$ phase shift oscillator using an ideal voltage amplifier, the frequency of oscillations is $41kHz$ . If $R = 5.6k\Omega$ , the value of capacitor is _____.                              | 01 |
| 1.14 | The slew rate of an op-amp is $6.28V/\mu sec$ . If it is a voltage follower with an input of $100 \sin \omega t$ , the maximum frequency of the input so that the output is not distorted = _____. | 01 |
| 1.15 | The $CMRR$ of an op-amp is $92dB$ , if its common mode gain = $0.5$ , its differential gain = _____ $dB$ .   | 01 |
| 1.16 | In a Schmitt trigger circuit using an op-amp with power supply voltages of $+12V$ and $-12V$ and feedback factor of $0.3$ , the hysteresis voltage is equal to _____.                              | 01 |
| 1.17 | The total power delivered by an $AM$ wave is $2640W$ . If the modulation index = $0.8$ , the power in each sideband = _____.   | 01 |
| 1.18 | The output of an $AM$ transmitter is given by<br>$V_{AM}(t) = 200(1 + 0.4 \sin 12560 t) \sin 6.28 \times 10^6 t.$ The frequency of $USB$ is _____.   | 01 |
| 1.19 | In a frequency modulation scheme, $25MHz$ carrier is modulated by $400Hz$ audio sine wave, with a maximum deviation of $10kHz$ . The modulation index is _____.                                    | 01 |

### PART-B

|   |   |  |    |
|---|---|--|----|
| 2 | a | Write the logic expression for exclusive-OR gate and realize it using minimum number of $NAND$ gates.  | 04 |
|   | b | Draw the truth table for "SUM" and "CARRYOUT" of a full adder. From the truth table, obtain the logic expression. From these expressions, realize the full adder using two half adders.  | 06 |
|   | c | Calculate the ac voltage in the circuit of Fig 2c.   | 06 |
|   |   |  <p style="text-align: center;">Fig 2c</p>   | 06 |
| 3 | a | A full wave bridge rectifier without a filter capacitor is connected to a load resistance of $1.5k\Omega$ . The input to the rectifier is $300 \sin 314t$ , through a step down transformer. If the dc load current is $80mA$ , calculate the turns ratio of the transformer. Assume all the diodes used are identical with a forward resistance of $50\Omega$ . Also determine the load regulation. | 06 |



|   |   |                |
|---|---|----------------|
| c | <p>An <i>NMOS</i> transistor where <math>V_t = 1V</math> and <math>K = 2mA/V^2</math> is operating in saturation with a drain current of <math>4mA</math>. Determine <math>V_{gs}</math> and calculate the trans-conductance <math>g_m</math>.</p> <p style="text-align: center;"><b>OR</b></p>   | 04             |
| 6 | <p>a An amplifier requires an input of <math>15mV</math> to produce a certain output. To get the same output with negative feedback, the required input signal is <math>330mV</math>. The closed loop voltage gain is <math>34dB</math>. Find open loop voltage gain of the amplifier and the feedback factor.</p> <p>b An <i>n</i>-channel <i>MOSFET</i> has a <math>V_t = 0.8V</math> and <math>I_D = 0.75mA</math> when <math>V_{gs} = V_{ds} = 2.5V</math>. Calculate:</p> <ol style="list-style-type: none"> <li>Drain current, if <math>V_{gs} = 4.2V</math> and <math>V_{ds} = 4.0V</math></li> <li>Drain to source resistance <math>r_{ds}</math> for small value of <math>V_{ds}</math>, if <math>V_{gs} = 4.8V</math></li> <li>Gain <math>A_V</math> if <math>V_{gs} = 4V</math> and <math>R_d = 10k\Omega</math>.</li> </ol> <p>c Draw the frequency response of an <i>RC</i> coupled <i>CE</i> amplifier and explain the effect of capacitor.</p> | 06<br>06<br>04 |
| 7 | <p>a Write six important specifications of an op-amp. In the circuit of Fig 7a, determine the output voltage <math>V_o</math>.</p> <div> </div> <p style="text-align: center;">Fig 7a</p> <p>b Draw the circuit of a Schmitt trigger using an ideal op-amp and explain its function with suitable waveform. Calculate the values of resistors <math>R_1</math> and <math>R_2</math>, given <math>V_{CC} = 12V</math> and <math>V_H = 6V</math>.</p> <p>c Draw the block diagram of data acquisition system and explain each block.</p>  | 06<br>06<br>04 |
| 8 | <p>a The output of an <i>AM</i> transmitter is given by<br/> <math display="block">V_{AM}(t) = 50(1 + 0.6 \cos 12560 t) \sin 628 \times 10^4 t.</math> Determine : <ol style="list-style-type: none"> <li>The sideband frequencies and their amplitudes</li> <li>Modulation index and bandwidth</li> <li>The minimum and maximum amplitudes of the <i>AM</i> wave</li> <li>The total power in the <i>AM</i> wave, if the load resistance is <math>10\Omega</math>.</li> </ol> </p> <p>b Write eight differences between <i>AM</i> and <i>FM</i> systems.</p> <p>c With a neat diagram, explain pulse code modulation system.</p>  | 08<br>04<br>04 |