

**B. Tech.**  
**(SEM I) THEORY EXAMINATION 2022-23**  
**EMERGING DOMAIN IN ELECTRONICS ENGINEERING**

Time: 3 Hours

Total Marks: 100

**Note:** Attempt all Sections. If you require any missing data, then choose suitably.

**SECTION A**

**1. Attempt all questions in brief.**

**2\*10 = 20**

|     |                                                                                                                                                     |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| (a) | What is PIV of Half wave and Full wave bridge rectifier.                                                                                            |
| (b) | Calculate the reverse saturation current of a diode if the current at 0.4V forward bias is 0.2 mA at room temperature and the ideality factor is 2. |
| (c) | How FET differs from the BJT?                                                                                                                       |
| (d) | Calculate the value of transconductance ( $g_m$ ) for a JFET, $I_{DSS}=12\text{mA}$ , $V_P = -3\text{V}$ at a bias point of $V_{GS} = -2\text{V}$   |
| (e) | What is the difference between microprocessor and microcontroller?                                                                                  |
| (f) | The output of a particular OPAMP increases 10V in $15\mu\text{s}$ . What is the slew rate?                                                          |
| (g) | Write down the truth table of 3 input X-NOR gate.                                                                                                   |
| (h) | State De Morgan's Law.                                                                                                                              |
| (i) | A broadcast radio transmitter radiates 15KW when the modulation percent is 70. How much is the carrier power?                                       |
| (j) | Define Satellite communication.                                                                                                                     |

**SECTION B**

**2. Attempt any three of the following:**

**10\*3 = 30**

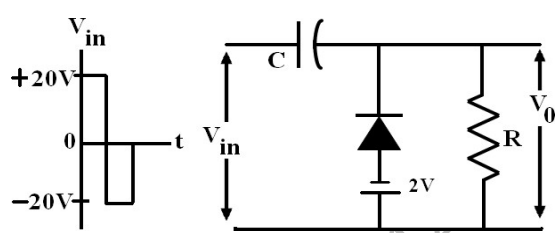
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|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (a) | (i) Write short notes on: LED and LCD.<br>(ii) Define the various components of IOT system with neat block diagram.                                                                                             |
| (b) | Draw and explain the common emitter (CE) circuit of a bipolar junction transistor. Sketch its output and input characteristics. Indicate the region of operation on output characteristics.                     |
| (c) | Explain unity gain OP-AMP. With suitable circuit diagram obtain the expression for integrator and differentiator OP-AMP.                                                                                        |
| (d) | (i) $(BDA.C)_{16} = ( )_{10}$<br>(ii) $(1110111)_2 = ( )_8$<br>(iii) Perform $(1011)_2 - (101)_2$ using 2's complement method.<br>(iv) $(225)_X = (341)_8$ , Find the value of X.<br>(v) $(78.25)_{10} = ( )_2$ |
| (e) | (i) Explain the amplitude modulation. Obtain an expression for an AM wave sinusoidal modulation.                                                                                                                |

|  |                                                                                                                                                                                                                                                              |
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|  | (ii) The antenna current of an AM broadcast transmitter, modulated to a depth of 40 percent by an audio sine wave, is 11A. It increases to 12A as a result of simultaneous modulation by another sine wave. What is the modulation index due to second wave. |
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### SECTION C

3. Attempt any *one* part of the following:

10\*1 = 10

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| (a) | <p>(i) Draw the circuit diagram and explain the working of a full wave bridge rectifier circuit.</p> <p>(ii) Define Static and Dynamic resistance of PN junction diode? Obtain the mathematical expression for the Dynamic resistance (<math>r_{ac}</math>).</p>                                     |
| (b) | <p>(i) Draw and explain the operation of center tapped full wave rectifier with input and output waveforms. Calculate ripple factor.</p> <p>(ii) Determine the output <math>V_0</math> for the given network.</p>  |

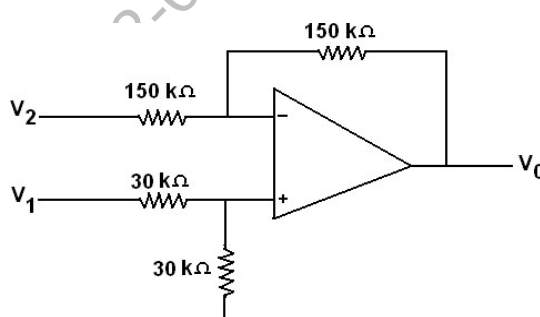
4. Attempt any *one* part of the following:

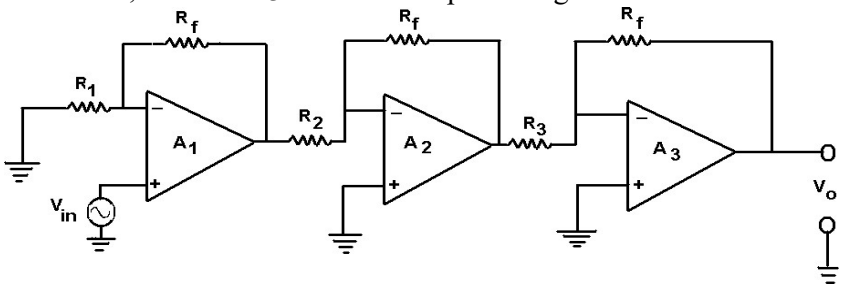
10 \*1 = 10

|     |                                                                                                                                                     |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| (a) | Explain construction, working and characteristics of n-channel Depletion MOSFET. Distinguish between D-MOSFET and E-MOSFET..                        |
| (b) | What is voltage multiplier? Draw and explain the circuit diagram of halfwave voltage Doubler. How can you construct voltage Tripler and Quadrupler? |

5. Attempt any *one* part of the following:

10\*1 = 10

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| (a) | <p>(i) Define an operational amplifier? Draw its block diagram. Draw the transfer characteristics.</p> <p>(ii) Determine the output voltage (<math>V_0</math>) for the given circuit, where <math>V_1 = 10V</math> and <math>V_2 = 5V</math></p>  |
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| (b) | <p>(i) Enlist the characteristics of OP-AMP. Obtain the expression for voltage gain in non-inverting OP-AMP.</p> <p>(ii) Calculate the output voltage for the given circuit, resistance value if <math>R_f = 470\text{K}\Omega</math>, <math>R_1 = R_2 = R_3 = 33\text{K}\Omega</math> for input voltage of <math>5\text{mV}</math>.</p>  |
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6. Attempt any *one* part of the following:

10\*1 = 10

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|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (a) | <p>(i) What are universal Gates.</p> <p>(ii) Construct the two input XOR gate by using only NAND gates</p>                                                 |
| (b) | <p>Simplify the given expression and implement this NOR gate only. <math>F(A, B, C, D) = \Pi(1, 3, 4, 5, 6, 7, 11, 12, 14, 15). d(2, 9, 10, 13)</math></p> |

7. Attempt any *one* part of the following:

10\*1 = 10

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| (a) | <p>An Audio frequency signal <math>10 \sin 2\pi \times 400t</math> is used to amplitude modulate a carrier of <math>50 \sin 2\pi \times 105t</math>. Calculate:</p> <p>(i) Modulation Index (ii) Amplitude of each side band</p> <p>(iii) Total power delivered to the load of <math>1\text{K}\Omega</math></p> <p>(iv) Bandwidth</p> <p>(v) Transmission efficiency</p> |
| (b) | <p>(i) Sketch the block diagram of communication systems and explain the function of each system.</p> <p>(ii) Explain the evolution of mobile communication.</p>                                                                                                                                                                                                         |