

**B.Tech-1st**  
**Basic Electronics**

*Full Marks : 50*

*Time :  $2\frac{1}{2}$  hours*

Answer **all** questions

*The figures in the right-hand margin indicate marks*

Symbols carry usual meaning

1. Answer *all* questions : 2 × 5

- (a) Find the average voltage and PIV rating of diode in bridge rectifier, if  $V_m = 16$  V.
- (b) What is the significance of the term field-effect ? Give the circuit symbol of n- and p-channel JFET.
- (c) What should be the input resistance and voltage gain of an ideal operational amplifier ?

( Turn Over )

(d) Explain the terms : bit, nibble and byte.

(e) Distinguish between carrier wave, modulating wave and modulated wave.

2. (a) Evaluate the ratio of the current for a forward bias of 0.06 V applied to a Ge p-n diode at 27° C to the current at 37°C.

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(b) Explain the operation of a bridge rectifier with the help of a circuit diagram. Mention its advantages and disadvantages when compared with a center-tapped full-wave rectifier.

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Or

(a) Sketch the output characteristics of a transistor operating in common-emitter mode. Explain the nature of the curves qualitatively.

4

(b) Explain the current amplification factor and leakage current for CB and CE configuration of a p-n-p transistor. Obtain the relationship between the amplification factors of above configurations.

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3. (a) When is the channel of a JFET said to be pinched off ? Define the pinch-off voltage. Give the relation between the pinch-off voltage, the saturation voltage, and the gate-source voltage. What is the pinch-off current ?

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(b) Describe how an n-channel MOSFET can be used either in the enhancement or the depletion mode ? Draw and explain the corresponding volt-ampere characteristics.

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Or

(a) What is an integrated circuit ? Mention the advantages and limitations of integrated circuits.

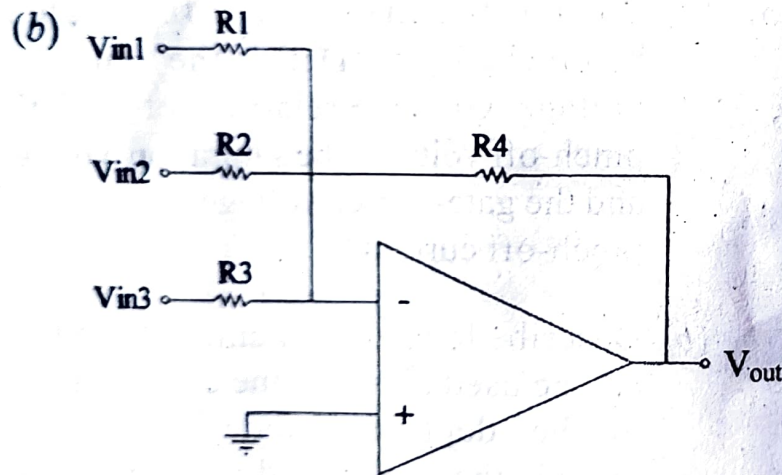
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( 4 )

(b) Describe the photolithographic etching process used in IC fabrication. 4

4. (a) Discuss the use of an Op-Amp as an inverting amplifier. 4



Compute the output voltage of the above circuit for  $V_{in1} = 0.2 \text{ V}$ ,  $V_{in2} = -0.5 \text{ V}$ ,  $V_{in3} = 0.8 \text{ V}$ ,  $R1 = 33 \text{ K}\Omega$ ,  $R2 = 22 \text{ K}\Omega$ ,  $R3 = 12 \text{ K}\Omega$  and  $R4 = 68 \text{ K}\Omega$ . 4

( 5 )

Or

(a) Derive an expression for the voltage gain of negative feedback amplifier. Show that the negative feedback improves the stability of the gain of an amplifier. 4

(b) What are the different ways of sampling the output signal in a feedback amplifier? Draw the feedback topologies to validate your answer. 4

5. (a) How can a decimal number (integer and fractional) be converted into a binary number? Explain with example. 4

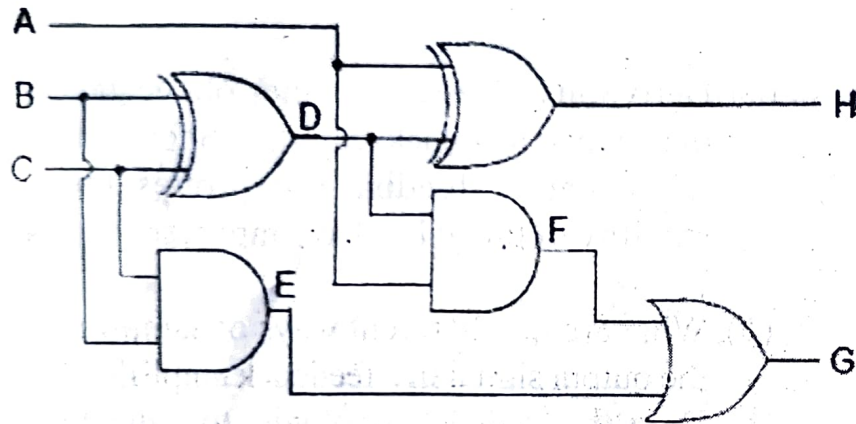
(b) Perform the binary addition  $100101 + 101 + 1101 + 100$ . Express the answer in binary, decimal and octal codes. 4

Or

(a) Subtract  $(39)_{10}$  from  $(15)_{10}$  using 2's complement method of subtraction. 4

( 6 )

(b)



Construct the Boolean function for 'H' and 'G'. Evaluate the function for A=1, B=1 and C=1.

4

6. (a) Explain the mechanism to trace a vertical line, horizontal line and a sine wave in a CRO screen.

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(b) Explain the principle of operation of DSO.

4

( 7 )

Or

(a) What is amplitude modulation ? Draw the waveform of amplitude-modulated signal when the carrier and modulating signals are sinusoidal. Obtain the expression for the AM wave.

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(b) Why modulation and demodulation are required in communication system ? With neat diagram, explain frequency modulation.

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