

**B. Tech-2 (All Br.)**  
**Basic Electronics**

*Full Marks : 70*

*Time : 3 hours*

**Answer all questions.**

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

**Symbols carry usual meaning.**

1. Answer *all* questions : 2 × 10

(a) What is time base voltage ? Why the time base voltage is generally given to X plate of a CRO ?

(b) Simplify the following expression

$$X.Y + X.(Y + Z) + Y.(Y + Z).$$

(c) The voltage at which forward current through the diode starts increasing rapidly called as \_\_\_\_\_.

(i) Saturation voltage

( Turn Over )





( 2 )

(ii) Breakover voltage

✓ (iii) Cut in voltage

(iv) Cut off voltage

(d) What is the range of  $n$  bit signed binary number?  $-(2^{n-1} - 1)$  to  $(2^{n-1} - 1)$  &  $\pm 0$

(e) What is last stage of a operational amplifier and why?

(f) How a BJT can be used as a switch?

✓ (g) What is the difference between zenor and avalanche breakdown?

(h) How a feedback ampifier will act as an oscillator?

(i)  $(24)_R + (17)_R = (40)_R$  Find the radix (R) so that the above statement is true.

✓ (j) If  $F = A + BC$ . Then prove  $F + F' = 1$ .



2. (a) Explain the working of positive clamping circuit. 4

- (b) In a full wave rectifier, the input is from a 30-0-30 V transformer. The load and diode forward resistances are  $100\ \Omega$  and  $10\ \Omega$  respectively. Calculate the average voltage, dc output power, ac input power, rectification efficiency and percentage regulation. 6

Or

✓ With a neat circuit diagram and waveforms explain the working of full wave bridge rectifier and show that its ripple factor is 0.48. 10

3. (a) In a Common Emitter transistor circuit if  $\beta = 100$  and  $I_B = 50\ \mu\text{A}$ , compute the values of  $\alpha$ ,  $I_E$  and  $I_C$ . 5

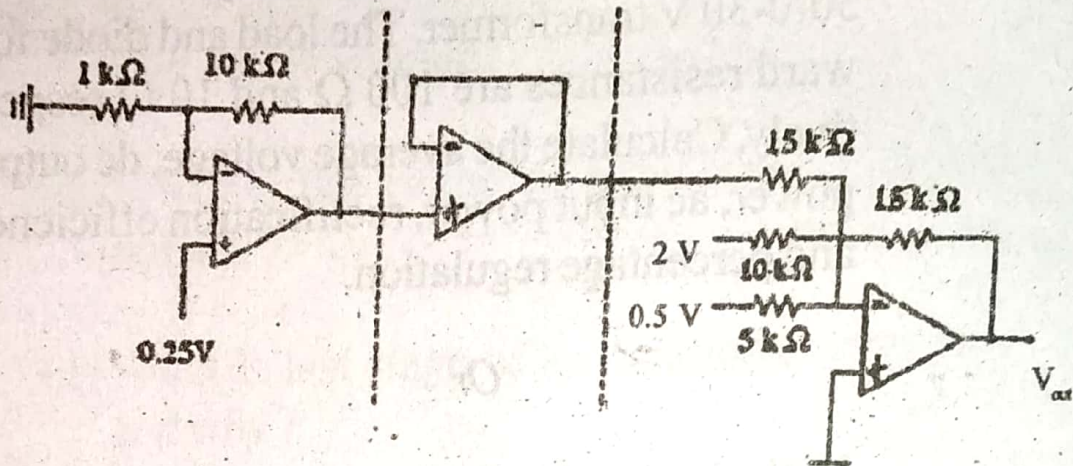
- ✓ (b) Derive the relationship between  $\alpha$ ,  $\beta$  and  $\gamma$ . In a PNP transistor operating in the active region, the emitter current  $I_E = 8\ \text{mA}$  and alpha ( $\alpha$ ) = 0.95. Compute the collector current  $I_C$  and base current  $I_B$ . Neglect  $I_{CO}$ . 5



( 4 )

Or

Find the output of the following op-amp circuits. 10



4. (a) Design a Full Adder and implement it using two Half Adders. 5

(b) Explain the operation of JK flip-flop with neat diagram. 5

Or

(a) Explain the operation of a NOT Gate with the help of switching circuit, Input/output waveforms and truth table. 5

(b) Design a logic circuit using basic gates with three inputs  $A$ ,  $B$ ,  $C$  and output  $Y$  that goes low only when  $A$  is high and  $B$  and  $C$  are different. 5



5. (a) What is input impedance of an ideal CRO ?  
Why ? Explain CRO as voltmeter. 5

(b) With appropriate block diagram, explain the  
principle operation of AM receiver. 5

Or

✓ Define AM. Draw the AM signal and its  
Spectrum. Derive an expression for total power  
in an AM signal. 10

$$A_f = \frac{A}{1 + \beta A_i}$$

✓ 6. (a) The open loop gain of an amplifier changes  
by 5 percents. If 10 dB negative feedback is  
applied, calculate percentage change of the  
closed loop gain. 5

✓ (b) Realize two input Ex-OR and NOR gates  
using only NAND gates. 5

Or

(a) Explain the working of an OPAMP based inte-  
grator circuit. Also draw the output wave form  
when 4 V peak to peak square wave voltage is  
applied. 5



- (b) What is Barkhausen criterion ? How this condition is used in oscillator ? Also, mention the primary requirements to obtain steady oscillation at a fixed frequency.

5