

**M. Sc. Electronics**  
**First Semester**  
**Analog Electronic Circuits & Devices**  
**(MSE-02)**

Duration: 3Hrs.

Full Marks: 70

**(PART-B: Descriptive)**

Duration: 2 hrs. 40 mins.

Marks: 50

**1. Answer the following questions: (any five):**

**5 × 2 = 10**

- a) Explain why an N-MOS is preferred than P-MOS?
- b) What are the limitations of h-parameters?
- c) Explain why CE configured transistor amplifier is preferred?
- d) Find -3dB frequency for an amplifier.
- e) Why voltage series feedback is commonly used in cascaded amplifier?
- f) What is the Barkhausen criterion for an Oscillator?
- g) Why an intrinsic semiconductor behaves like an insulator at absolute zero temperature?

**2. Answer the following questions: (any five)**

**5 × 3 = 15**

- a) Explain the main differences between an ordinary diode and zener diode?
- b) Find an Expression of Fermi level in an intrinsic semiconductor.
- c) Find the relation between  $\alpha$  and  $\beta$ .
- d) For CE configured transistor prove that  $I_C = \beta I_B + (1 + \beta) I_{CO}$

- e) For an n-channel JFET prove that  $g_m = g_{m0}(1 - V_{GS}/V_p)$
- f) What are the characteristics of an ideal OP-AMP?
- g) Calculate  $V_{CE}$  for a CE transistor amplifier as shown in the Fig.1

Given:  $V_{CC} = 20V$

$V_{in} = 10V$

$V_{BE} = 0.7V$

$R_C = 3.3K\Omega$

$\beta = 200$

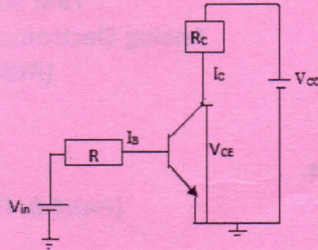


Fig.1

**3. Answer any five Questions :( any five)**

**5×5=25**

- Find an expression of output voltage for an integrator by an OP-AMP.
- Show that the bandwidth increases in negative feedback amplifier.
- Find an expression for power efficiency of transformer coupled class a amplifier.
- Find an expression of pinch-off voltage for an n-channel JFET.
- Explain with neat diagram how CE npn transistor can be used as an amplifier as well as inverter.
- Explain the V-I characteristics curve of an n-channel MOSFET with different drain current.
- Find an expression for output voltage and calculate the output voltage for the given values as shown in the Fig.2

Given:  $R=1K$ ,  $V_1=5V$ ,

$V_2=3V$

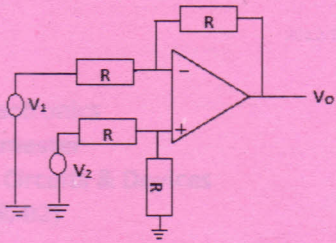


Fig.2

*N.B: The symbols have usual meanings*

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**M.Sc. Electronics**  
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**ANALOG ELECTRONIC CIRCUITS & DEVICES**  
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**PART A: Objective**

Time: 20 Min

Total marks: 20

Select the correct answer: (All Questions are compulsory):

20 × 1 = 20

(put 'V' mark on the appropriate answer)

- Which of the following transistor configuration produces 180° phase shift in output?  
(a) CB (b) CE  
(c) CC (d) All of them
- The cut-in voltage of a Germanium diode is  
(a) 0.7V (b) 0.2V  
(c) 0.3V (d) None
- The efficiency of a full wave rectifier is  
(a) 46.6% (b) 1.21  
(c) 81.2% (d) 0.21
- A negative feedback amplifier  
(a) Increases gain (b) Increases bandwidth  
(c) Decreases bandwidth (d) All of them
- If  $V_{Smax}$  is the PIV of a half wave rectifier then the PIV of full wave rectifier is given by  
(a)  $V_{Smax}$  (b)  $\frac{V_{Smax}}{2}$   
(c)  $2 V_{Smax}$  (d)  $\sqrt{V_{Smax}}$
- In an intrinsic semiconductor the Fermi level lies  
(a) Near conduction band (b) Near valency band  
(c) At middle band (d) None
- At very high temperature an n-type semiconductor behaves like  
(a) Insulator (b) Metal  
(c) p-type semiconductor (d) Intrinsic semiconductor
- If  $\beta_1$  and  $\beta_2$  are the current gain of two transistor amplifier then overall current will be  
(a)  $\frac{\beta_1}{\beta_2}$  (b)  $\beta_1 + \beta_2$   
(c)  $\beta_1 - \beta_2$  (d)  $\beta_1 \times \beta_2$

9. If  $f_L$  and  $f_H$  are the lower cut-off and upper cut-off frequency of an amplifier respectively then the centre cut-off frequency will be
- (a)  $f_L \times f_H$  (b)  $\frac{f_L \times f_H}{2}$   
(c)  $\frac{f_L - f_H}{2}$  (d)  $\sqrt{f_L \times f_H}$
10. An ideal OP-AMP has
- (a) Infinite bandwidth (b) Infinite input impedance  
(c) Infinite CMRR (d) All of them.
11. The audio frequency range is
- (a) 10Hz–20Hz (b) 20Hz–20KHz  
(c) 10MHz–20MHz (d) 10KHz–20KHz
12. In FM radio the frequency range is
- (a) 87KHz–105KHz (b) 87MHz–105MHz  
(c) 90GHz–100GHz (d) None
13. If a differential amplifier has differential mode gain 100 and common mode gain 0.01 then CMRR in dB will be
- (a) 80dB (b) 90dB  
(c) 85dB (d) 100dB
14. Which of the following is called high speed logic family?
- (a) TTL (b) RTL  
(c) DTL (d) ECL
15. As temperature increases the mobility of carriers in semiconductor
- (a) Increases (b) Decreases  
(c) Remains constant (d) None
16. In FETs the carriers move by the process of
- (a) Diffusion only (b) Drift only  
(c) Diffusion and Drift (d) None
17. If a transistor amplifier has  $\alpha = 0.99$  then the current gain in CC transistor amplifier will be
- (a) 100 (b) 101  
(c) 0.99 (d) 99
18. In BJT the current flows due to
- (a) Electrons only (b) Holes only  
(c) Both electrons and holes (d) None
19. In an n-channel FET current flows due to
- (a) Electrons only (b) Holes only  
(c) Both electrons and holes (d) none
20. In an npn transistor the buried layer on the p-type substrate is
- (a)  $n^+$  doped (b)  $p^+$  doped  
(c) both  $n^+$  and  $p^+$  doped (d) none

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