# University of Mumbai

## Examination 2020 under Cluster 06

## (Lead College: Vidyavardhini's College of Engg Tech)

**Examinations Commencing from 7th January 2021 to 20th January 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2019

Examination: SE Semester III

Course Code: ELC304 and Course Name: **Electrical Networks Analysis and Synthesis**

Time: 2 hour Max. Marks: 80

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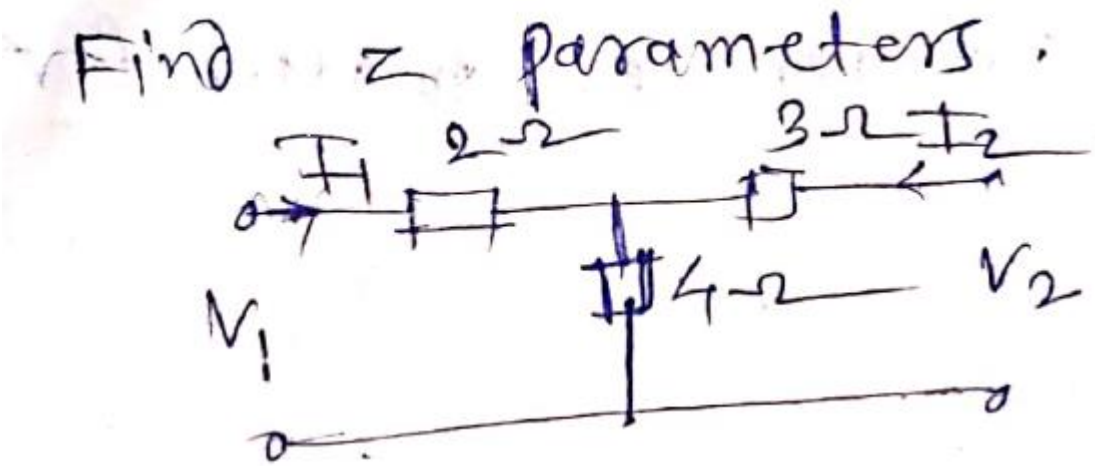
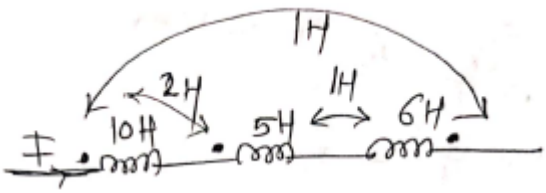
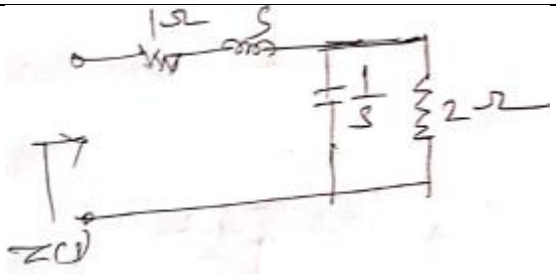
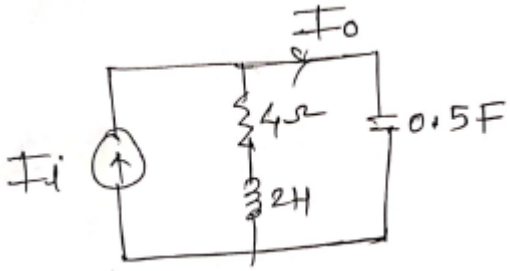
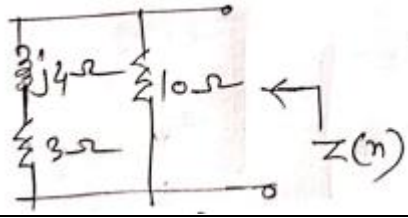
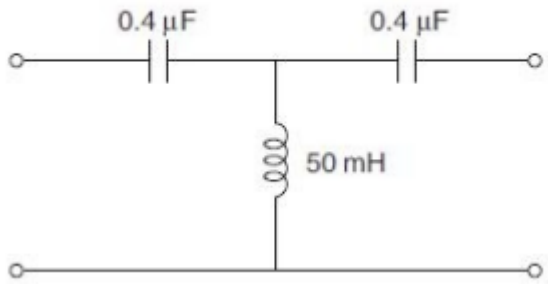
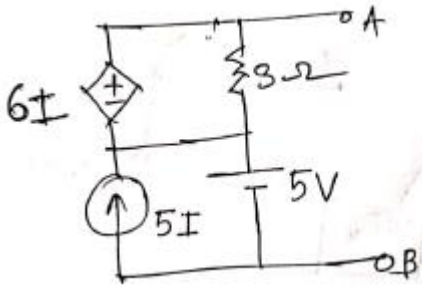
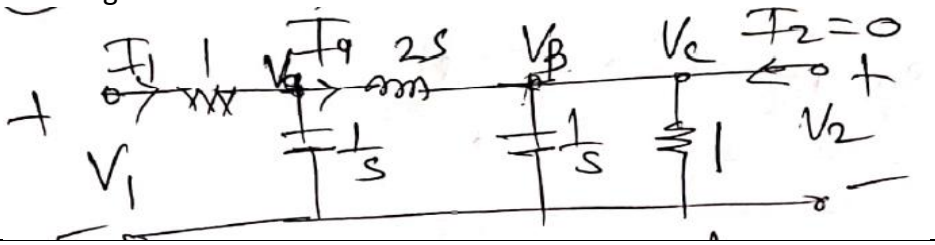
| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** |
|---|---|
| | |
| 1. | Which is the condition of symmetry for h parameters |
| Option A: | h12 = -h21 |
| Option B: | h11h22-h12h21 = 1 |
| Option C: | h11h21-h12h22 = 1 |
| Option D: | h11 = 22 |
| | |
| 2. | A dependent source |
| Option A: | May be a current source or a voltage source |
| Option B: | Is always a voltage source |
| Option C: | Is always a current source |
| Option D: | Neither a current source nor a voltage source |
| | |
| 3. |  |
| Option A: | $\begin{bmatrix} 6 & 4 \\ 4 & 7 \end{bmatrix}$ |
| Option B: | $\begin{bmatrix} 4 & 6 \\ 6 & 7 \end{bmatrix}$ |

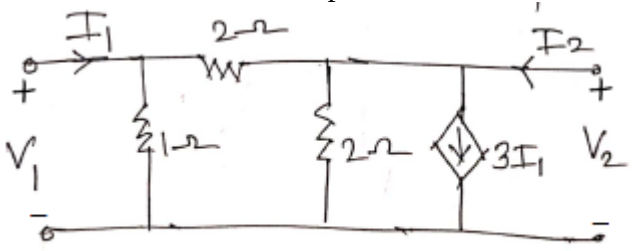
| | |
|---|---|
| Option C: | $\begin{bmatrix} 4 & 6 \\ 4 & 6 \end{bmatrix}$ |
| Option D: | $\begin{bmatrix} 6 & 4 \\ 7 & 4 \end{bmatrix}$ |
| | |
| 4. | Application of Norton's theorem to a circuit yields |
| Option A: | Equivalent current source and impedance in series |
| Option B: | Equivalent current source and impedance in parallel |
| Option C: | Equivalent impedance |
| Option D: | Equivalent current source |
| | |
| 5. | In time domain analysis, the initial condition from t = -∞ to t = $0^-$ denotes |
| Option A: | Just after switching condition |
| Option B: | Steady State Condition |
| Option C: | After switching condition |
| Option D: | Just before switching condition |
| | |
| 6. | Which is this function<br>$z(s) = \frac{4(s^2+1)(s^2+9)}{s(s^2+4)}$ |
| Option A: | RC Function |
| Option B: | RL Function |
| Option C: | LC Function |
| Option D: | RLC Function |
| | |
| 7. | Find equivalent inductance.<br>  |
| Option A: | 12 H |
| Option B: | 13 H |
| Option C: | 15 H |
| Option D: | 21 H |
| | |
| 8. | Find driving point impedance Z(S). |

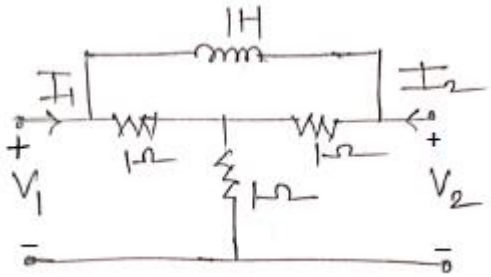
| | |
|---|---|
| |  |
| Option A: | $\frac{2s^2-3s+3}{2s+1}$ |
| Option B: | $\frac{2s^2+3s+3}{2s+1}$ |
| Option C: | $\frac{2s^2+3s-3}{2s+1}$ |
| Option D: | $\frac{2s^2-3s-3}{2s+1}$ |
| | |
| 9. | The necessary and sufficient condition for a rational function F(S)to be the driving point impedance of an RC network is that all poles and zeros should be |
| Option A: | Simple and lie on the negative real axis in the s plane. |
| Option B: | Complex and lie in the left half of s plane. |
| Option C: | Complex and lie in the right half of s plane. |
| Option D: | Simple and lie on the positive real axis of the s plane. |
| | |
| 10. | For the given network find poles and zeros of function $I_o/I_i$  |
| Option A: | Zeros at -0,-2 and poles at 1,1 |
| Option B: | Zeros at 0,-2 and poles at 1,1 |
| Option C: | Zeros at 0,-2 and poles at -1,-1 |
| Option D: | Zeros at 0,2 and poles at -1,-1 |
| | |
| 11. | Which is the condition of symmetry for ABCD parameters |
| Option A: | AD-BC = 1 |
| Option B: | B = C |
| Option C: | AB – CD = 1 |
| Option D: | A = D |
| | |

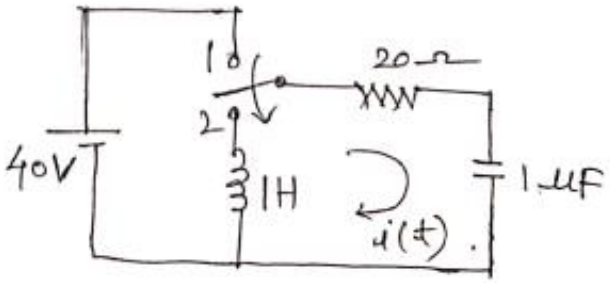
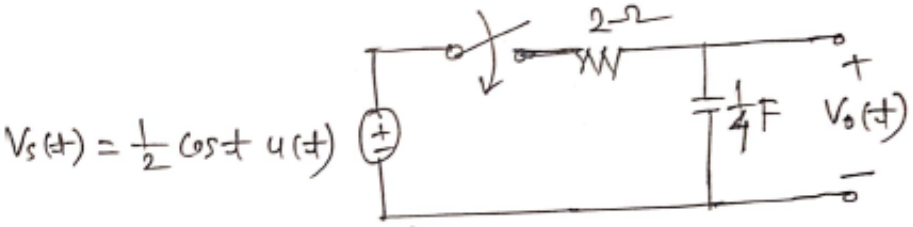
| | |
|---|---|
| 12. | Calculate Z(n)<br>  |
| Option A: | 3.86 angle $36.03^0$ ohm |
| Option B: | 3.86 angle $-36.03^0$ ohm |
| Option C: | 3.68 angle $36.03^0$ ohm |
| Option D: | 3.68 angle $-36.03^0$ ohm |
| | |
| 13. | The concept on which superposition theorem based is |
| Option A: | Reciprocity |
| Option B: | Duality |
| Option C: | Non-linearity |
| Option D: | Linearity |
| | |
| 14. | The cut-off frequency of given circuit is<br>  |
| Option A: | 3.183 kHz |
| Option B: | 795.77 Hz |
| Option C: | 1.591 kHz |
| Option D: | 253.3 Hz |
| | |
| 15. | Find the voltage $V_{AB}$<br>  |
| Option A: | 11 I |
| Option B: | 3+6 I |
| Option C: | 6 I+5 |
| Option D: | 31 I |
| | |
| 16. | Two identical sections of the network are connected in cascade having ABCD parameters as |

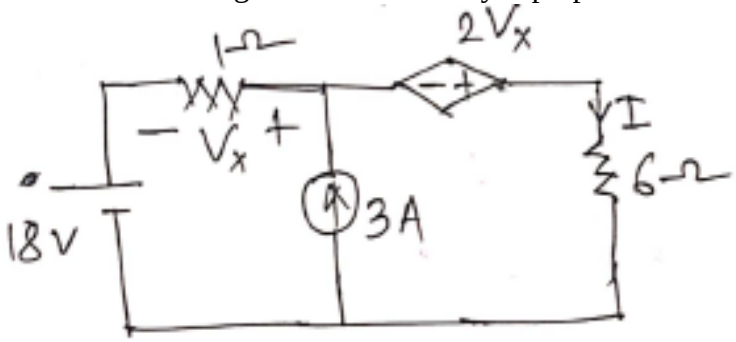
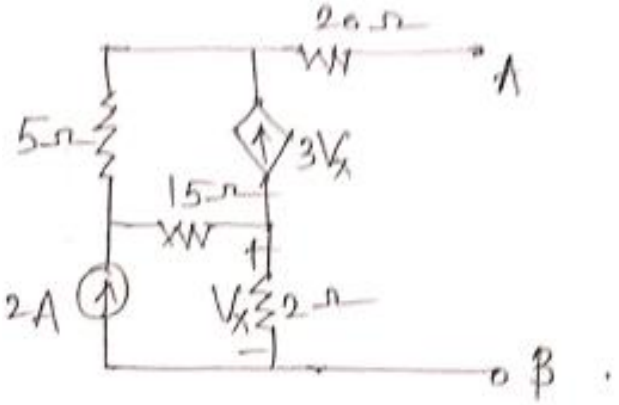
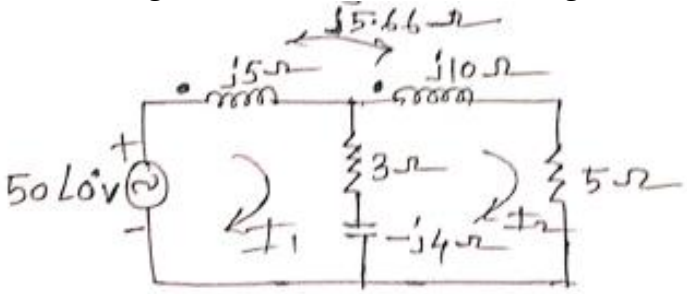
| | |
|---|---|
| | $\begin{bmatrix} A & B \\ C & D \end{bmatrix} = \begin{bmatrix} 7 & 8 \\ 2.5 & 3 \end{bmatrix}$, Find Overall ABCD parameters |
| Option A: | $\begin{bmatrix} 80 & 69 \\ 25 & 29 \end{bmatrix}$ |
| Option B: | $\begin{bmatrix} 69 & 25 \\ 80 & 29 \end{bmatrix}$ |
| Option C: | $\begin{bmatrix} 29 & 25 \\ 80 & 69 \end{bmatrix}$ |
| Option D: | $\begin{bmatrix} 69 & 80 \\ 25 & 29 \end{bmatrix}$ |
| | |
| 17. | Kirchhoff's current law states that |
| Option A: | Net current flow at the junction is positive |
| Option B: | Algebraic sum of the currents meeting at the junction is zero |
| Option C: | No current can leave the junction without some current entering it |
| Option D: | Current can leave the junction without some current entering it |
| | |
| 18. | At t = $0^-$ , No saturation condition has been reached. At t = 0, Switching action for application of DC source to inductive circuit. At t = $0^+$, What will be the status of inductor? |
| Option A: | As it is |
| Option B: | Open Circuit |
| Option C: | Short Circuit |
| Option D: | Current Source |
| | |
| 19. | In Maximum Power Transfer Theorem Pmax is |
| Option A: | $\frac{Vth}{2Rth}$ |
| Option B: | $\frac{Vth^2}{2Rth}$ |
| Option C: | $\frac{Vth^2}{4Rth}$ |
| Option D: | $\frac{Vth^2}{2RL}$ |

| | |
|---|---|
| 20. | For the given ladder network which is not correct.<br>  |
| Option A: | VC =V2 |
| Option B: | Vb = V2 |
| Option C: | Va = Vb |
| Option D: | Va = 2sIa + Vb |

| **Q2 (20 Marks)** | |
|---|---|
| A | **Solve any Two 5 marks each** |
| i. | Test Whether the given function is positive real function.<br>$F(s) = \frac{2s^3+2s^2+3s+2}{s^2+1}$ |
| ii. | Synthesis in Cauer II<br>$Z(s) = \frac{(s+1)(s+3)}{s(s+2)}$ |
| iii. | Synthesis in Cauer I<br>$Z(s) = \frac{(s^2+1)(s^2+9)}{s(s^2+4)}$ |
| B | **Solve any One 10 marks each** |
| i. | Determine Y and ABCD parameters<br>  |
| ii. | Find Z- parameters |

| | |
|---|---|
| |  |

| **Q3 (20 Marks)** | |
|---|---|
| A | **Solve any Two 5 marks each** |
| i. | In the network shown in figure the switch is changed from the position 1 to the position 2 at t = 0, steady state condition having reached before switching. Find values of i, di/dt, and $d^2i/dt^2$. At $t = 0^+$<br>  |
| ii. | For the network shown in figure, find the response$V_0(t)$<br>  |

| | |
|---|---|
| iii. | Find the current through 6 ohm resistor by superposition theorem.<br>  |
| B | **Solve any One 10 marks each** |
| i. | For the network shown in figure. Find Norton's equivalent network.<br>  |
| ii. | Find the voltage across the 5 ohm resistor using mesh analysis.<br>  |

# University of Mumbai

## Examination 2020 under Cluster 06

## (Lead College: Vidyavardhini's College of Engg Tech)

**Examination Commencing from 7th January 2021 to 20th January 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2019

Examination: SE Semester III

Course Code: ELC303 and Course Name: Digital Logic Circuits

Time: 2 hour Max. Marks: 80

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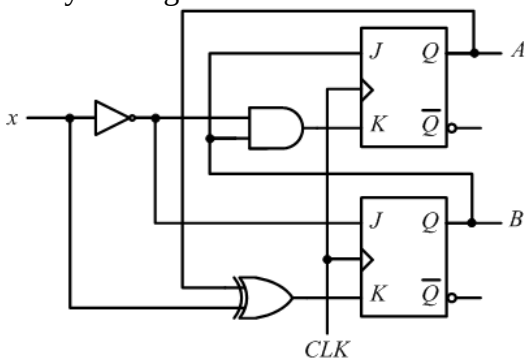
| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** |
|---|---|
| | |
| 1. | What is the decimal equivalent of $(11111)_2$. |
| Option A: | $(41)_{10}$ |
| Option B: | $(21)_{10}$ |
| Option C: | $(31)_{10}$ |
| Option D: | $(11)_{10}$ |
| | |
| 2. | What is the reflected binary code of $(100101)_{2.}$ |
| Option A: | 111000 |
| Option B: | 101010 |
| Option C: | 101111 |
| Option D: | 110111 |
| | |
| 3. | Given the two binary numbers x=1010100 and y=1000011 perform the subtraction x-y, using 2's complement. |
| Option A: | 0010001 |
| Option B: | 1101110 |
| Option C: | 1111111 |
| Option D: | 0000111 |
| | |
| 4. | How many two-input AND and OR gates are required to realize Y = AB+CD+E? |
| Option A: | 2,2 |
| Option B: | 2,3 |
| Option C: | 3,2 |
| Option D: | 3,3 |
| | |
| 5. | If a half adder has A and B as the inputs, then the sum is given by |
| Option A: | A EX-NOR B |
| Option B: | A OR B |
| Option C: | A AND B |
| Option D: | A XOR B |
| | |
| 6. | What are the number of select lines required for a 8:1 multiplexer? |
| Option A: | 1 |
| Option B: | 2 |

| | |
|---|---|
| Option C: | 3 |
| Option D: | 4 |
| | |
| 7. | A decoder converts ‘n’ inputs to _____ number of outputs. |
| Option A: | $2^n$ |
| Option B: | n |
| Option C: | $n^2$ |
| Option D: | 2n |
| | |
| 8. | A basic latch circuit consists of |
| Option A: | one comparator |
| Option B: | three adders |
| Option C: | two inverters |
| Option D: | one amplifier |
| | |
| 9. | A ‘n-stage’ Johnson counter will circulate a single data bit giving sequence of ____ number of states. |
| Option A: | 2n |
| Option B: | n |
| Option C: | n+1 |
| Option D: | $n^2$ |
| | |
| 10. | A decade counter can be implemented with how many number of flip flops? |
| Option A: | 10 |
| Option B: | 5 |
| Option C: | 4 |
| Option D: | 8 |
| | |
| 11. | MSI counter IC74163 is |
| Option A: | 4 bit up counter with synchronous preset and clear |
| Option B: | ripple counter |
| Option C: | decade counter |
| Option D: | 4 bit up counter with asynchronous preset and clear |
| | |
| 12. | In a sequential circuit designed as a moore machine, the output depends on |
| Option A: | present state |
| Option B: | past state |
| Option C: | next state |
| Option D: | external inputs |
| | |
| 13. | IC 7490 is a |
| Option A: | Group A Asynchronous counter IC |
| Option B: | Group B Asynchronous counter IC |
| Option C: | Group C Asynchronous counter IC |
| Option D: | synchronous counter |
| | |
| 14. | The internal structure of MSI counter IC 7493 consist of |
| Option A: | Mod 2 and Mod 6 counter |
| Option B: | Mod 2 and Mod 8 counter |

| | |
|---|---|
| Option C: | Mod 5 and Mod 8 counter |
| Option D: | Mod 2 and Mod 5 counter |
| | |
| 15. | An AND gate with 8 input has a fan-out of |
| Option A: | 8 |
| Option B: | 4 |
| Option C: | 2 |
| Option D: | 1 |
| | |
| 16. | What does FPGA stand for |
| Option A: | Field Programming Gate Array |
| Option B: | Field Programmable Gate Array |
| Option C: | First Program Gate Array |
| Option D: | First Programmable Gate Array |
| | |
| 17. | Programmable Array Logic has |
| Option A: | a programmable AND and fixed OR array |
| Option B: | a programmable AND and a programmable OR array |
| Option C: | only a programmable AND array |
| Option D: | only a programmable OR array |
| | |
| 18. | In verilog HDL the operator <= is used for |
| Option A: | Blocking assignment |
| Option B: | Non-Blocking assignment |
| Option C: | Single line comment |
| Option D: | Logical left shift |
| | |
| 19. | Which type of modeling style is not used in verilog hardware description language |
| Option A: | Structural |
| Option B: | Datatype |
| Option C: | Behavioral |
| Option D: | Data Flow |
| | |
| 20. | The Verilog expression for Boolean equation Y=AB+C will be |
| Option A: | assign Y= (A*B)+C |
| Option B: | assign Y= (A.B)+C |
| Option C: | assign Y= (A^B)\|C |
| Option D: | assign Y= (A&B)\|C |

| **Q2.**<br>**(20 Marks Each)** | |
|---|---|
| A | **Solve any Two 5 marks each** |
| i. | Design and implement a half adder using gates. |
| ii. | State and prove De-Morgan's theorem. |
| iii. | Compare mealy and moore machines. |
| B | **Solve any One 10 marks each** |
| i. | Design a Mod-10 asynchronous counter using J-K Flip–Flops. |
| ii. | Write a program using Verilog HDL to implement a 8:1 multiplexer. |

| **Q3.**<br>**(20 Marks Each)** | |
|---|---|
| A | **Solve any Two 5 marks each** |
| i. | Write a short note on Complex Programmable Logic Devices. |
| ii. | Convert a JK Flip-Flop to T Flip-Flop. |
| iii. | Write a program for a D flip-flop with asynchronous reset using Verilog HDL. |
| B | **Solve any One 10 marks each** |
| i. | Design and implement full subtractor circuit using a 3:8 decoder IC 74138. |
| ii. | Analyze the given state machine and draw the state diagram.<br>  |

# University of Mumbai
## Examination 2020 under Cluster 06
## (Lead College :- Vidyavardhini's College of Engineering & Technology)

**Examinations Commencing from 7th January 2021 to 20th January 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev. 2019

Examination: S.E. Semester III

Course Code: ELC302 and Course Name: Electronic Devices & Circuits – I

Time: 2 hour Max. Marks: 80

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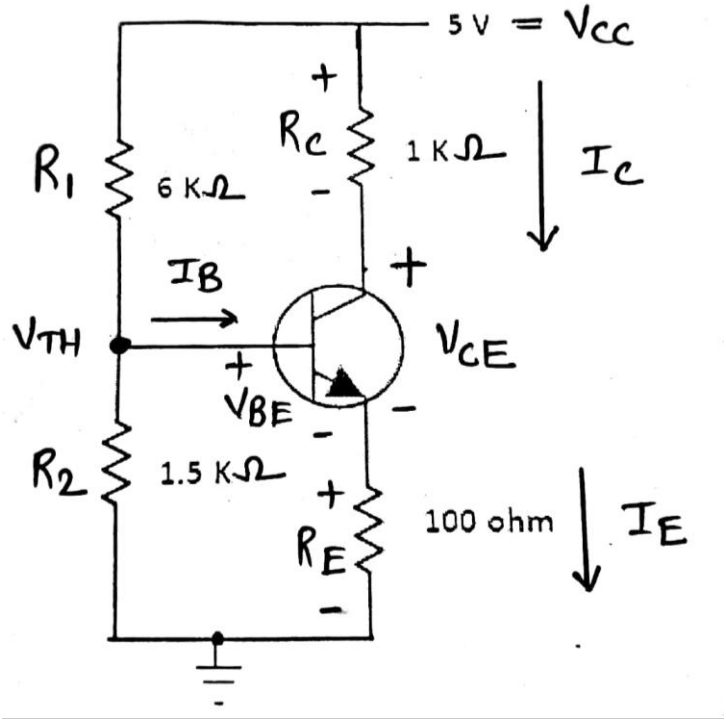
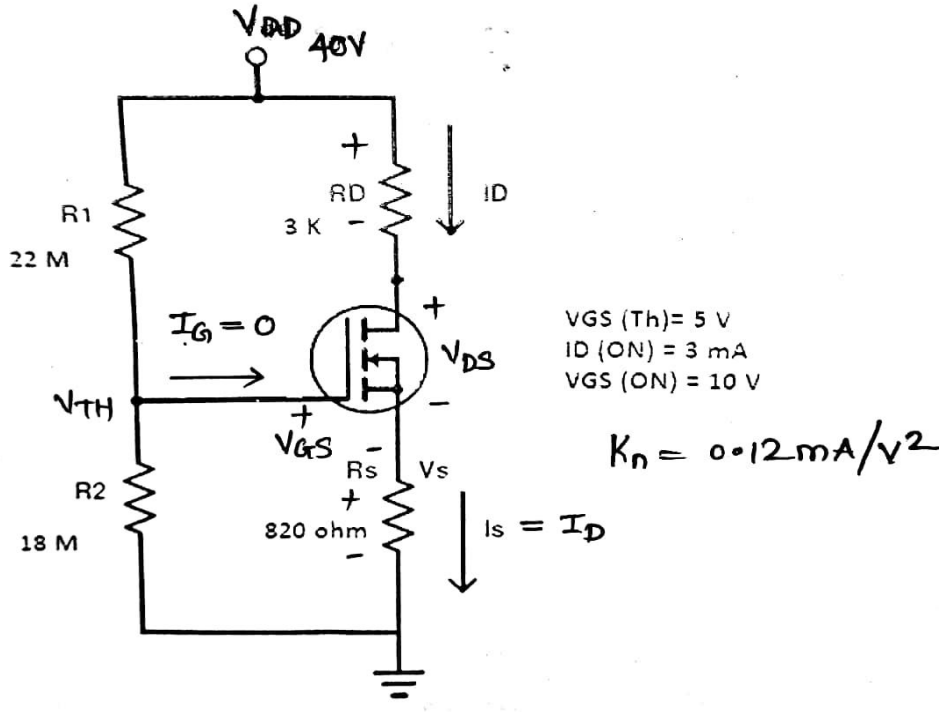
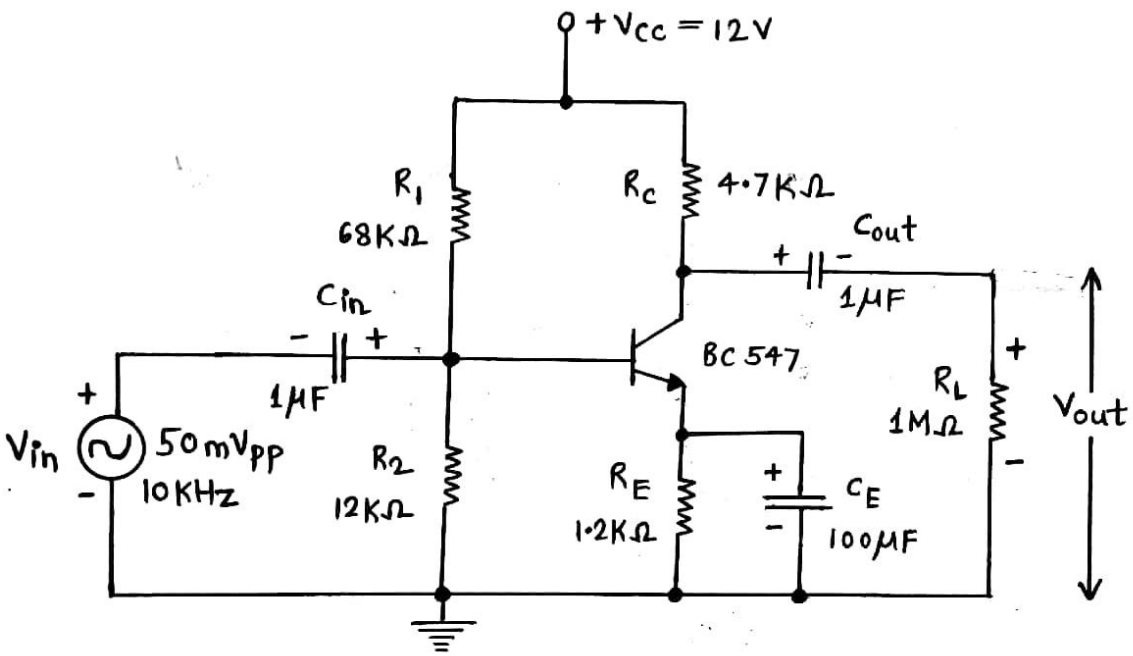
| **Q.1** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks.** |
|---|---|
| 1. | The capacitance in a reverse biased PN junction is called as :- |
| Option A: | Terminal capacitance |
| Option B: | Junction capacitance |
| Option C: | Diffusion capacitance |
| Option D: | Transition capacitance |
| | |
| 2. | In any semiconductor material, the diffusion current is proportional to :- |
| Option A: | Applied electric field |
| Option B: | Concentration gradient of charge carriers |
| Option C: | Square of applied electric field |
| Option D: | Cube of applied electric field |
| | |
| 3. | The phenomenon of Zener breakdown occurs in :- |
| Option A: | Heavily doped PN junction |
| Option B: | Lightly doped PN junction |
| Option C: | Moderately doped PN junction |
| Option D: | Forward biased PN junction |
| | |
| 4. | Forward break-over voltage ($V_{FBO}$) of a typical silicon diode is approximately :- |
| Option A: | 0.6 V – 0.7 V |
| Option B: | 0.2 V – 0.3 V |
| Option C: | 1.1 V – 1.2 V |
| Option D: | 0.1 V – 0.2 V |
| | |
| 5. | When a reverse current in Zener diode increases from 20 mA to 30 mA, Zener voltage changes from 5.6 V to 5.65 V. The Zener resistance ($r_z$) is given by :- |
| Option A: | 2 Ω |
| Option B: | 3 Ω |
| Option C: | 4 Ω |
| Option D: | 5 Ω |
| | |
| 6. | In bipolar junction transistor (BJT) which mode of operation is not commonly used in real life applications ? |
| Option A: | The inverse / reverse mode of operation |
| Option B: | The cut-off mode of operation |
| Option C: | The saturation mode of operation |
| Option D: | The forward active / linear mode of operation |
| | |

| | |
|---|---|
| 7. | In bipolar junction transistor (BJT) the Early effect is due to :- |
| Option A: | Decrease in width of the emitter due to reverse bias of collector-to-base junction |
| Option B: | Decrease in width of the base due to reverse bias of collector-to-base junction |
| Option C: | Decrease in width of collector due to reverse bias of collector-to-base junction |
| Option D: | Temperature variations resulting in thermally generated minority carriers |
| | |
| 8. | In PNP bipolar junction transistor (BJT), stream of current in active region is due to :- |
| Option A: | Drift of holes |
| Option B: | Drift of electrons |
| Option C: | Diffusion of holes |
| Option D: | Diffusion of electrons |
| | |
| 9. | In a bipolar junction transistor (BJT) if $\beta = 100$ & collector current ($I_C$) is 30 mA then what is the value of base current ($I_B$) ? |
| Option A: | 0.03 mA |
| Option B: | 0.3 mA |
| Option C: | 3 mA |
| Option D: | 300 mA |
| | |
| 10. | The field effect transistor (FET) is :- |
| Option A: | Power controlled device |
| Option B: | Energy controlled device |
| Option C: | Current controlled device |
| Option D: | Voltage controlled device |
| | |
| 11. | Pinch-off voltage in field effect transistor (FET) is :- |
| Option A: | Drain-to-source voltage giving zero (no) drain-to-source current |
| Option B: | Drain-to-source voltage giving maximum drain-to-source current |
| Option C: | Gate-to-source voltage giving zero (no) drain-to-source current |
| Option D: | Gate-to-source voltage giving maximum drain-to-source current |
| | |
| 12. | Which of the following statement is not true for any field effect transistor (FET) ? |
| Option A: | FET has very high input resistance / impedance as compared to BJT |
| Option B: | FET is a majority carrier operated (unipolar) device |
| Option C: | FET has excellent operating stability against temperature variations compared to BJT |
| Option D: | FET has higher transconductance compared to BJT |
| | |
| 13. | In junction field effect transistor (JFET), the amplification factor ($\mu$) is expressed by which of the following mathematical expressions ? |
| Option A: | $\mu = g_m \times r_d$ |
| Option B: | $\mu = g_m + r_d$ |
| Option C: | $\mu = g_m - r_d$ |
| Option D: | $\mu = g_m / r_d$ |
| | |
| 14. | For metal oxide semiconductor field effect transistor (MOSFET), the input impedance or the input resistance ($R_i$ or $Z_i$) is :- |
| Option A: | Less than JFET but more than BJT |
| Option B: | More than both, JFET & BJT |
| Option C: | More than JFET but less than BJT |
| Option D: | Less than both, JFET & BJT |
| | |
| 15. | In MOSFET, which terminal is electrically isolated from the entire device structure ? |

| | |
|---|---|
| Option A: | Source (S) |
| Option B: | Drain (D) |
| Option C: | Gate (G) |
| Option D: | Bulk or Body or Substrate (SS) |
| | |
| 16. | In design of filters, which of these has the lowest value of ripple factor (γ) ? |
| Option A: | Capacitor (C) Filter |
| Option B: | Inductor (L) Filter |
| Option C: | Inductor & Capacitor (L-C) Filter |
| Option D: | C-L-C or 'π' Filter |
| | |
| 17. | Maximum operating efficiency of a full wave bridge type rectifier to be considered during the design process is :- |
| Option A: | 25 % |
| Option B: | 40.6 % |
| Option C: | 81.2 % |
| Option D: | 50 % |
| | |
| 18. | Which of these statements in not true for any type of BJT common base (CB) configuration amplifier ? |
| Option A: | It has a low input impedance / resistance |
| Option B: | It has a high output impedance / resistance |
| Option C: | It has moderate to high voltage gain |
| Option D: | It produces a phase shift in amplified output signal with respect to input signal applied |
| | |
| 19. | Which process of electron-hole pair (EHP) is responsible for emitting of light ? |
| Option A: | Recombination |
| Option B: | Diffusion |
| Option C: | Breakdown |
| Option D: | Ionization |
| | |
| 20. | Which of these diodes does not work in the reverse bias mode of operation ? |
| Option A: | Light emitting diode (LED) |
| Option B: | Zener diode |
| Option C: | Varactor diode |
| Option D: | Photo diode |

| **Q.2 (20 Marks)** | **Solve any Four out of Six** **05 Marks Each** |
|---|---|
| A | Explain the effects of temperature on the V – I characteristics of PN junction diode with a neat sketch / diagram & appropriate mathematical expressions. |
| B | Describe forward bias V – I characteristics of PN junction diode with neat labeled diagram & appropriate sketch. |
| C | Explain working of Center Tap type full wave rectifier with help of circuit diagram. |
| D | Discuss the working / operation of dual end clipper circuit with a neat labeled diagram showing appropriate waveforms of the resulting clipped output voltage. |
| E | Explain the operation of Zener diode as a voltage regulator with a neat sketch for condition where supply / source voltage remains constant but load resistor varies. |
| F | With a neat sketch, describe the operating principle & the construction of the light emitting diode (LED). |

| Q.3 (20 Marks) | **Solve any Two out of Three** **10 Marks Each** |
|---|---|
| A | For a voltage divider bias circuit shown in Fig. 1 using Silicon (Si) BJT with β = 100 calculate the Q – point where Q = [$V_{CE}$, $I_C$].   **Fig. 1 for Q.3 (A)** |
| B | For the voltage divider bias circuit shown in Fig. 2 using N-channel E-MOSFET calculate Q – point where Q = [$V_{DS}$, $I_D$].   **Fig. 2 for Q.3 (B)** |

| | |
|---|---|
| C | Fig. 3 shows a single stage CE – BJT amplifier using BC 547 where β = 300 & $V_{BE}$ = 0.7 V. Calculate the input resistance ($R_i$), output resistance ($R_o$) & small signal voltage gain ($A_v$).<br>  <br><br>**Fig. 3 for Q.3 (C)** |

# University of Mumbai

**Examinations Commencing from 7th January 2021 to 20th January 2021**

Program: **BE Electronics Engineering**

Curriculum Scheme: Rev 2019 'C' Scheme

Examination: SE Semester III

Course Code: **ELC301** and Course Name: **Engineering Mathematics III**

Time: 2 hour Max. Marks: 80

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**Note : Q1 carrying 40 marks. Q2 and Q3 are carrying 20 equal marks.**

| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** |
|---|---|
| | |
| 1. | Find Laplace transform of $f(t) = 1,\ 0 < t < 5; \quad f(t) = 0,\ t > 0$ |
| Option A: | $\frac{1- e^{-5s}}{s}$ |
| Option B: | $\frac{1}{s} e^{-5s}$ |
| Option C: | $\frac{1}{s}$ |
| Option D: | $\frac{1+ e^{-5s}}{s}$ |
| | |
| 2. | If $L[f(t)] = log\left(\frac{s+3}{s+1}\right)$, find $L[f(2t)]$ |
| Option A: | $2\ log\left(\frac{s+3}{s+1}\right)$ |
| Option B: | $2\ log\left(\frac{s+6}{s+2}\right)$ |
| Option C: | $\frac{1}{2} log\left(\frac{s+3}{s+1}\right)$ |
| Option D: | $\frac{1}{2} log\left(\frac{s+6}{s+1}\right)$ |
| | |
| 3. | Find $L[te^{-3t} sint]$ |
| Option A: | $\frac{2s-6}{(s^2-6s+10)^2}$ |
| Option B: | $\frac{2s+6}{(s^2+6s+10)^2}$ |
| Option C: | $\frac{1}{(s+3)^2+1}$ |
| Option D: | $\frac{1}{(s^2-6s+10)^2}$ |
| | |
| 4. | Find $L\left[\int_0^t u\ sin3u\ du\right]$ |
| Option A: | $\frac{2}{(s^2+1)^2}$ |
| Option B: | $\frac{2}{(s^2+3)^2}$ |
| Option C: | $\frac{6}{(s^2+9)^2}$ |

| | |
|---|---|
| Option D: | $\frac{2s}{(s^2+1)^2}$ |
| | |
| 5. | $L^{-1}\left[\frac{s+5}{s^2-25}\right]$ =? |
| Option A: | $cos5t + 5\ sin5t$ |
| Option B: | $cosh5t + 5\ sinh5t$ |
| Option C: | $cosh5t + sinh5t$ |
| Option D: | $cosht + 5\ sinht$ |
| | |
| 6. | Find $L^{-1}\left[\frac{s-2}{s^2-4s+13}\right]$ |
| Option A: | $e^{2t}\frac{sin3t}{3}$ |
| Option B: | $e^{-2t}\frac{sin3t}{3}$ |
| Option C: | $e^{2t}sin3t$ |
| Option D: | $e^{2t}cos3t$ |
| | |
| 7. | In Fourier series of $f(x) = xcosx$ in $(-\pi, \pi)$ . The value of $a_n$ is |
| Option A: | 0 |
| Option B: | $\frac{-1}{2}$ |
| Option C: | $\frac{(-1)^n}{n^2-1}$ |
| Option D: | $\frac{1}{n^2-1}$ |
| | |
| 8. | $f(x) = \begin{cases} cosx, & -\pi < x < 0 \\ -cosx, & 0 < x < \pi \end{cases}$ is |
| Option A: | Both even and odd function |
| Option B: | neither even nor odd |
| Option C: | odd function |
| Option D: | Even function |
| | |
| 9. | The Fourier series for f(x) in $(0,2\pi)$ is $f(x) = \frac{\pi}{2} - \frac{1}{\pi}\sum_{n=1}^{\infty}\frac{1}{n^2}cosnx$. Find the value of $\frac{1}{2\pi}\int_0^{2\pi}[f(x)]^2\ dx$ |
| Option A: | $\frac{\pi^3}{4} + \frac{1}{\pi}\sum_{n=1}^{\infty}\frac{1}{n^4}$ |
| Option B: | $\frac{\pi^2}{4} + \frac{1}{2\pi^2}\sum_{n=1}^{\infty}\frac{1}{n^4}$ |
| Option C: | $\frac{\pi^3}{2} - \frac{1}{\pi}\sum_{n=1}^{\infty}\frac{1}{n^4}$ |
| Option D: | $0$ |
| | |
| 10. | A function f(t) is periodic with period $2\pi$ if |

| | |
|---|---|
| Option A: | $f(t+2\pi)=0$ |
| Option B: | $f(t+2\pi)=2\pi$ |
| Option C: | $f(t+2\pi)=f(2\pi)$ |
| Option D: | $f(t+2\pi)=f(t)$ |
| | |
| 11. | Which of the following functions is NOT analytic |
| Option A: | Sinhz |
| Option B: | Cosz |
| Option C: | $\bar{z}$ |
| Option D: | $z^2+z$ |
| | |
| 12. | For f(z) = u + iv analytic, which of the following statement is correct |
| Option A: | f(z) may satisfy Cauchy-Riemann equation. |
| Option B: | f(z) is constant function |
| Option C: | f(z) =0 |
| Option D: | u, v both are harmonic |
| | |
| 13. | Find k such that $f(z)=\frac{1}{2}\log(x^2+y^2)+itan^{-1}\frac{kx}{y}$ is analytic |
| Option A: | K=1 |
| Option B: | K=-1 |
| Option C: | K=0 |
| Option D: | K=2 |
| | |
| 14. | Find the characteristic roots of matrix $A$ , Where $A=\begin{bmatrix}3 & -1 & 1\\ -1 & 5 & -1\\ 1 & -1 & 3\end{bmatrix}$ |
| Option A: | $\lambda=1,\ 2,\ 3$ |
| Option B: | $\lambda=1,\ 1,\ -2$ |
| Option C: | $\lambda=2,\ 3,6$ |
| Option D: | $\lambda=-2,-3,-6$ |
| | |
| 15. | $\lambda=5$ is one of the eigenvalues of $A=\begin{bmatrix}1 & 2 & 2\\ 2 & 1 & 2\\ 2 & 2 & 1\end{bmatrix}$. Find the eigenvector corresponding to eigenvalue $\lambda=5$ is |
| Option A: | [1 −1 0]’ |
| Option B: | [1 1 1]’ |
| Option C: | [1 −1 −1]’ |
| Option D: | [1 0 −1]’ |

| | |
|---|---|
| 16. | If A = $\begin{bmatrix} 1 & 2 & 8 \\ 0 & -1 & 3 \\ 0 & 0 & 2 \end{bmatrix}$ Find Eigen Values of $A^2 + 3A + 2A^{-1} + I$ |
| Option A: | 7,-3,12 |
| Option B: | 6,-4,11 |
| Option C: | 1,-1,2 |
| Option D: | 7,-3,15 |
| | |
| 17. | If the matrix A has eigen value 1,1,5 then algebraic multiplicity of A for $\lambda = 1$ is |
| Option A: | -1 |
| Option B: | 0 |
| Option C: | 1 |
| Option D: | 2 |
| | |
| 18. | The divergence and curl of $\bar{a} = 2i - 3j + k$ is |
| Option A: | div $\bar{a}$=0 , curl $\bar{a}$=5 |
| Option B: | div $\bar{a}$=2 , curl $\bar{a}$=0 |
| Option C: | div $\bar{a}$=3 , curl $\bar{a}$=3 |
| Option D: | div $\bar{a}$=0 , curl $\bar{a}$=0 |
| | |
| 19. | Find the value of a if $\bar{F} = (x - 2z)i + (y - 5x)j + (az + 2x)k$ is solenoidal |
| Option A: | $a = 2$ |
| Option B: | $a = -2$ |
| Option C: | $a = -4$ |
| Option D: | $a = 4$ |
| | |
| 20. | Evaluate $\int_C ydx + x\,dy$ along $y = x^2$ from A(0,0) to B(1,1) |
| Option A: | 0 |
| Option B: | 2xy |
| Option C: | -1 |
| Option D: | 1 |

| **Q2.** **(20 Marks Each)** | **Solve any Four out of Six** **5 marks each** |
|---|---|
| A | *Find* $L\left[e^{-t}\int_0^t e^u \cosh u\,du\right]$ |
| B | $L^{-1}\left[\log\left(1+\frac{4}{s^2}\right)\right] s$ |
| C | *Obtain the Fourier series for* $e^{-x}$ *in* $(0,2\pi)$ |
| D | *Find the analytic function* $f(z)$ *whose imaginary part is* $e^{-x}(y\sin y + x\cos y)$ |
| E | *Show that* $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ *satisfies Cayley-Hamilton theorem. Hence find* $A^{-1}$ |

| | |
|---|---|
| F | Evaluate by using Green's theorem $\int_C (x^2 - y)dx + (2y^2 + x)dy$, *where* C is the closed region bounded *by* $y = 4$ and $y = x^2$ |

| **Q3.** **(20 Marks Each)** | **Solve any Four out of Six** **5 marks each** |
|---|---|
| A | *Evaluate* $\int_0^\infty e^{-3t}\left(\frac{sinht\ sint}{t}\right)\ dt$ |
| B | *Find* $L^{-1}\left[\frac{s}{(s^2+4s+13)^2}\right]$ |
| C | *Obtain the half range Fourier sine series expansion for* $f(x) = (x - x^2)$ *in* $(0,2)$ |
| D | *Obtain the orthogonal trajectories for the family of curves* $e^{-x}\ cosy = C$ . |
| E | *Check whether the matrix* $A = \begin{bmatrix} 2 & 3 & 4 \\ 0 & 2 & -1 \\ 0 & 0 & 1 \end{bmatrix}$ *is diagonalizable* |
| F | Show that $\bar{F} = (y^2 - z^2 + 3yz - 2x)i + (3xz + 2xy)j + (3xy - 2xz + 2z)k$ is both irrotational and solenoidal. |