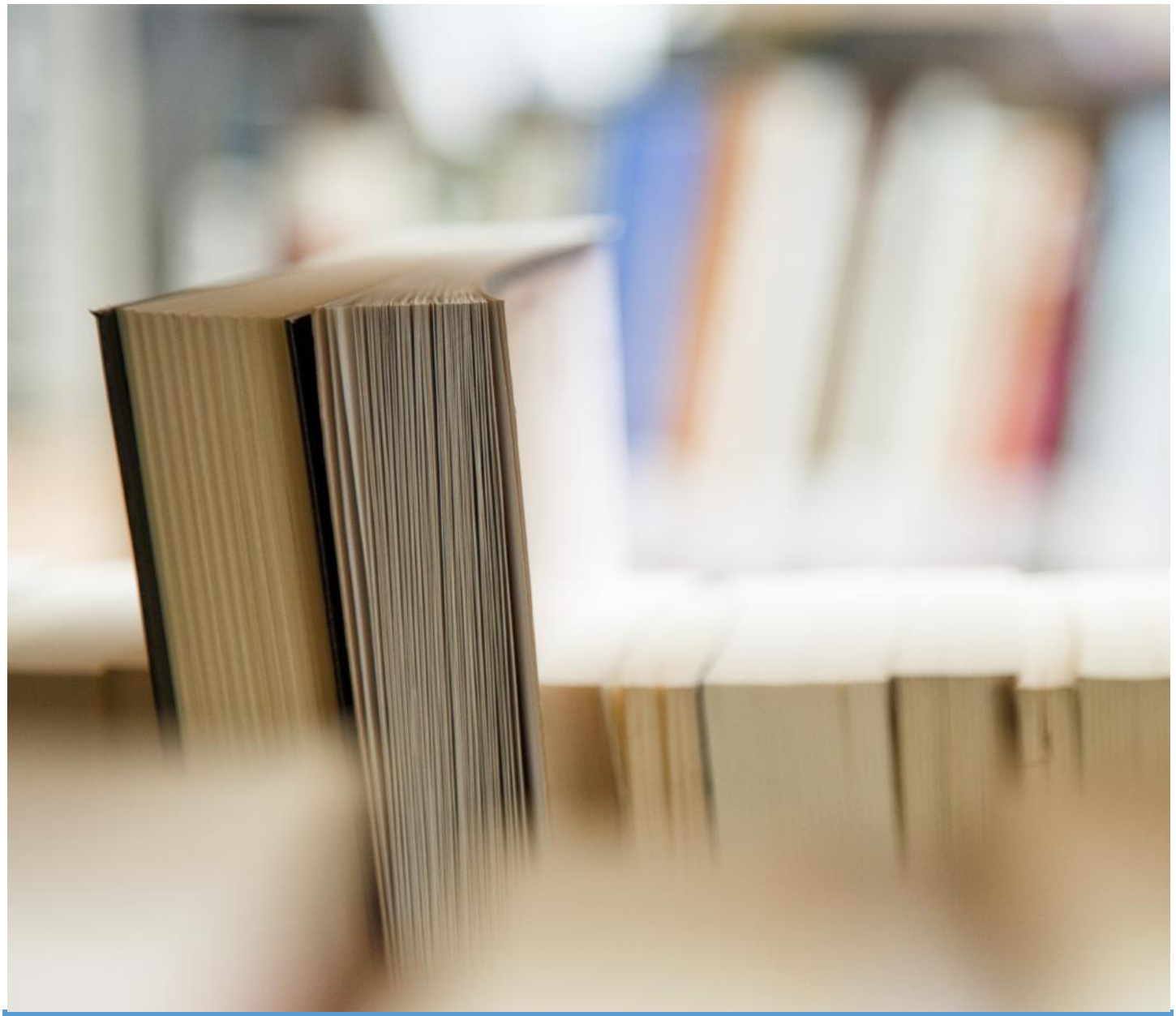


# 2018 BATCH QUESTION BANK

## SEMESTER 3, 2018 - 2022

**Staff Advisors:- Ms. Anagha. A.S and Ms. Anjana. N**

QUESTIONS COMPILED BY

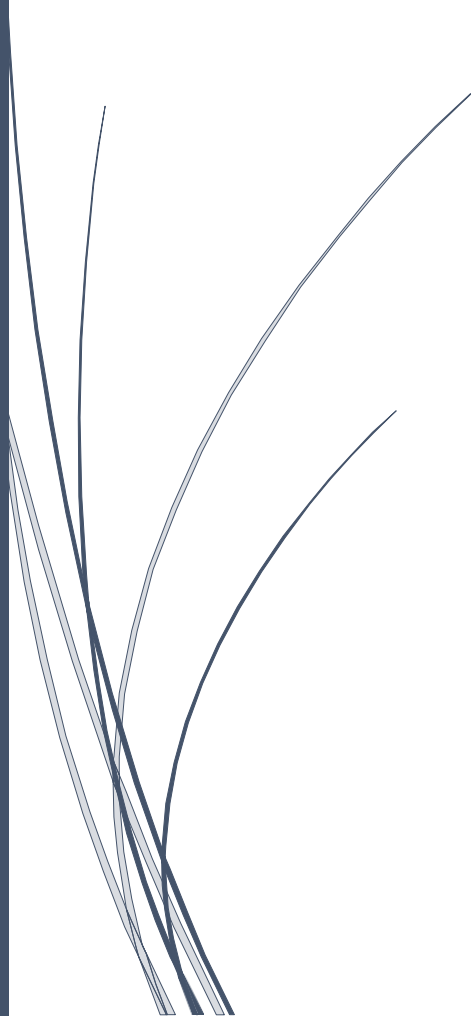
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

**VIDYA ACADEMY OF SCIENCE & TECHNOLOGY TECHNICAL CAMPUS, KILIMANOOR**

2018 Batch S3
(2018-2022)

# EC 201 NETWORK THEORY

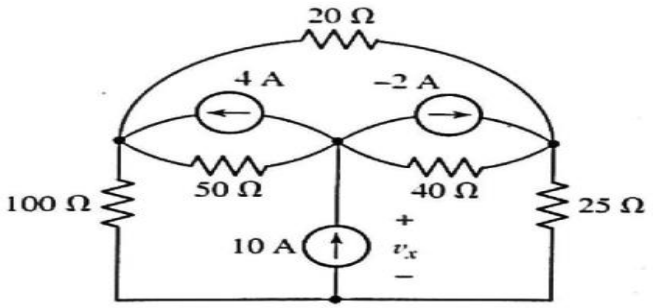
***Faculty – Mr. Chandu C.B.***



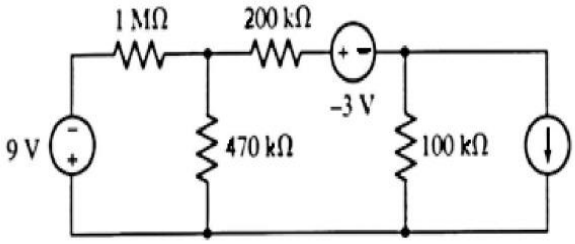
1. Give the advantages and disadvantages of tie-set matrix 2

2. State Kirchhoff's current law. 2

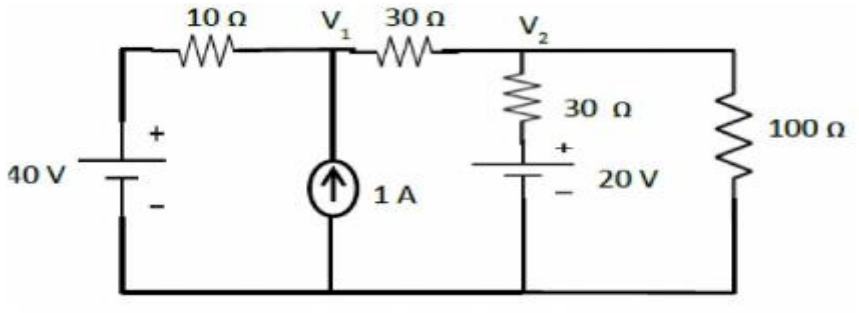
3. Use nodal analysis to find $v_x$ in the circuit. 6




4. b. Explain source transformations and use it to determine the power dissipated by 1MΩ resistance. 7

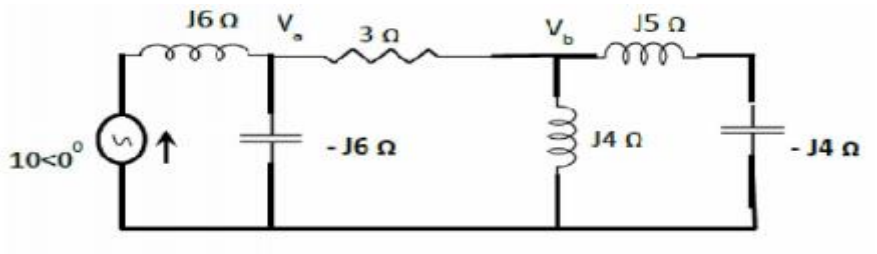



5. Find the current in 100Ω resistor using nodal analysis. 5

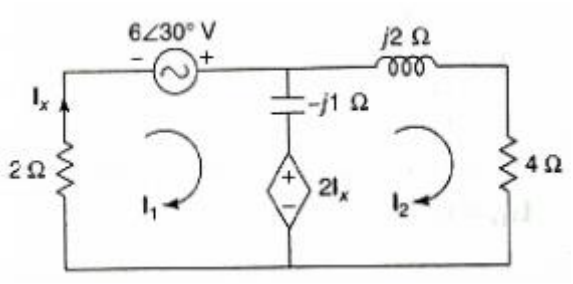



6. Differentiate between (i) tree and co tree (ii) links and twigs. 2

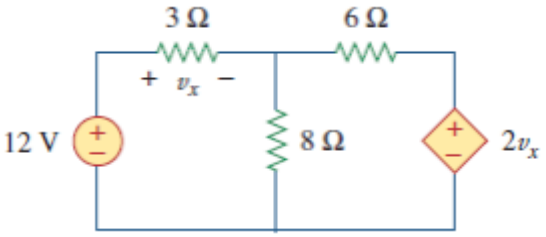
7. Determine Va and Vb, from the given circuit. 7




8. In the network find the voltage across the 4Ω resistor 6




9. Determine $v_x$ in the circuit using source transformation



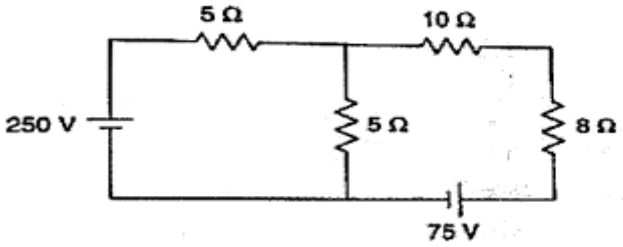

10. . Find the Laplace Transforms of the given functions:

(a) 8e -3t cosh t u(t - 2) (b) [sin βt]/t u(t) (c) t2 cos (2t + 30$^o$ ) u(t) (d) 5 u(t/2)

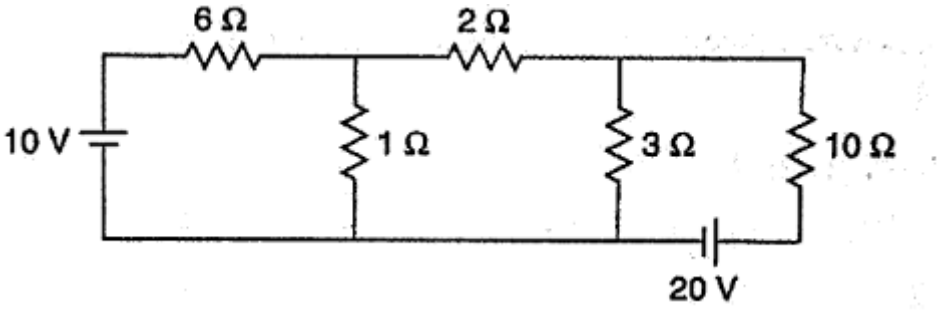
(e) 5 cos(2t - 1) u(t)

11. a) State and prove initial value theorem and final value theorem

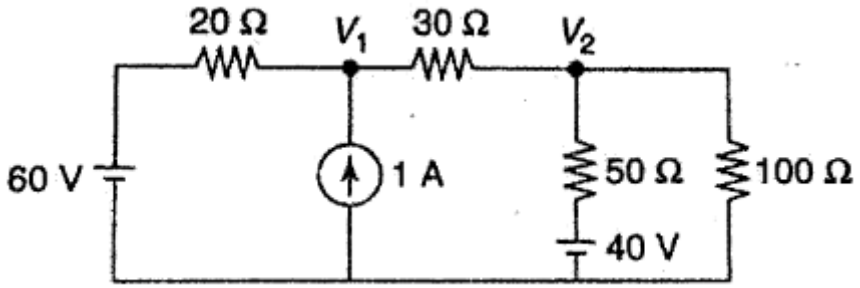
b) Find the current through 8Ω resistor in the network using Thevenin's theorem




12. Find the current through 2 n resistor using Mesh analysis

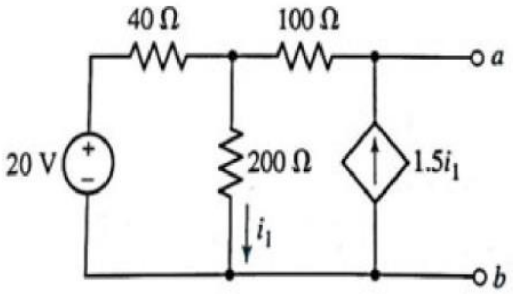



13. Find the current in the 100 nresistor using Nodal analysis

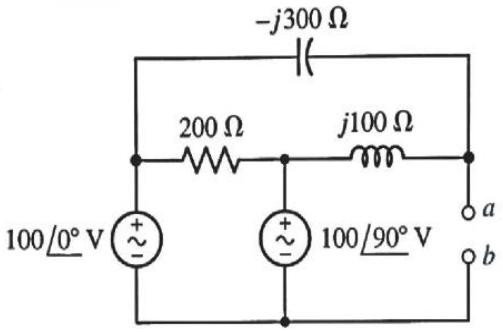



**MODULE-2**

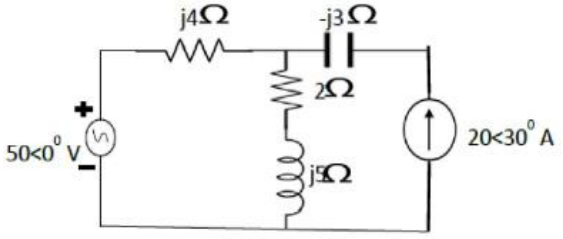
1. b. Find the Thevenin equivalent of the network shown in figure. What power would be delivered to a load of 100 ohms at *a* and *b*? 6



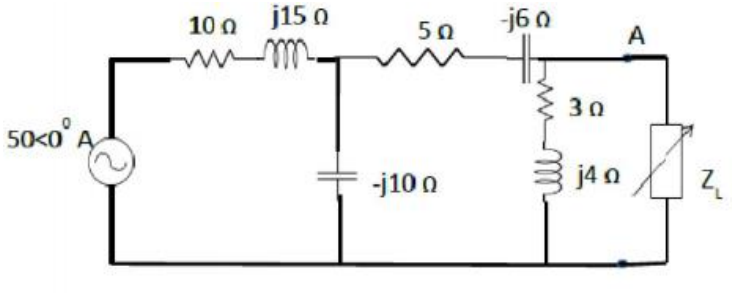

2. State and Prove maximum Power transfer theorem 3
3. Find the Thevenin equivalent circuit with respect to terminals *a* and *b* 9




4. State and prove time differentiation and time integration theorems in Laplace Transform 6
5. State super position theorem. 2
6. Using super position theorem find the voltage across (2+j5)Ω impedance for the network shown. 6




7. Determine the maximum power delivered to the load 4




8. a)State and prove time integration theorem 4

   b) State and prove final value theorem and initial value theorems. 7

9. Find Laplace transform of (i)$(1-e^{-t})/t$ (ii)$(t+1)^2e^t$ 4

10 Find inverse Laplace transform of (2s+1)/(s2 +2)(s+1). 4

## MODULE-3

1. Derive transient current and voltage responses of sinusoidal driven RL and RC circuits. 10

2. Find the inverse Laplace Transform of the function F(s). 10

$$F(s) = \frac{3s^2 + 2s + 3}{s^2 + 3s + 2}$$

3. Solve $y'' - 10y' + 9y = 5t$, $y(0) = -1$, $y'(0) = 2$ using Laplace transform. 10

4. Explain the transformation of basic circuit elements into the s-domain, considering nonzero initial conditions. 10

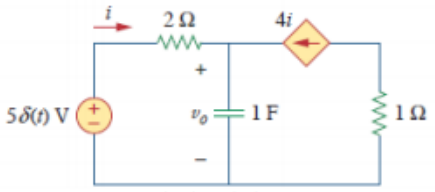
5. Perform the transient analysis of a series RLC circuit to impulse, step, pulse, exponential and sinusoidal inputs. 10

6. The step responses of a series *RLC* circuit are given below. Find R, L, C. 10

$$v_c(t) = [30 - 10e^{-20t} + 30e^{-10t}]u(t)\text{V}$$

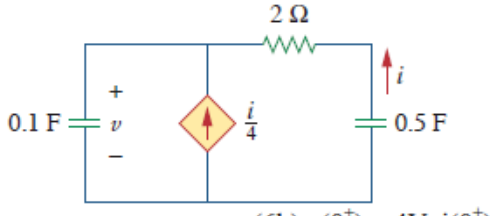
$$i_L(t) = [40e^{-20t} - 60e^{-10t}]u(t)\text{mA}$$

7. Find the voltage across the capacitor for t>0.




(6a)$v_o(0^-) = 0$ V

$= 2A$




(6b) $v(0^+) = 4V$, $i(0^+)$

8. Find the inverse Laplace transform of the following functions:

a. $H(s) = \dfrac{4}{(s+1)(s+3)}$ b. $V(s) = \dfrac{2s + 26}{s(s^2 + 4s + 13)}$ c. $\dfrac{s+1}{(s+2)(s^2 + 2s + 5)}$

9. Solve for y(t) in the following differential equation if the initial conditions are zero:

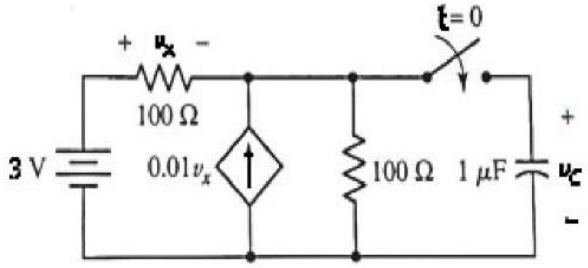
$$\frac{d^3y}{dt^3} + 6\frac{d^2y}{dt^2} + 8\frac{dy}{dt} = e^{-t}\cos 2t$$

10 Given v(0) = 2 and dv(0)/dt = 4, solve $\frac{d^2v}{dt^2} + 5\frac{dv}{dt} + 6v = 10e^{-t}u(t)$

## MODULE-4

1. Explain how to determine the time domain behaviour from the pole - zero plot. 5

2. Find $v_C(t)$ for $t>0$ in the circuit. 7




3. What are the restrictions on pole and zero locations for transfer functions and driving-point functions. 5

4. Plot the magnitude and phase response for the transfer function, V2/V1 of an RC two port network (Integrator) 5

5. What is a port? Differentiate between single-port and two-port networks. 5

6. What are poles and zeros of a network function? Illustrate using an example. Why are poles and zeros considered to be significant? 7

7. List the properties of a transfer function. 8

8. How can the sinusoidal steady-state response of a network be obtained from its network function? Explain. 10

9. How is the impulse response of a network related to its transfer function? Show the relationship between them. 7

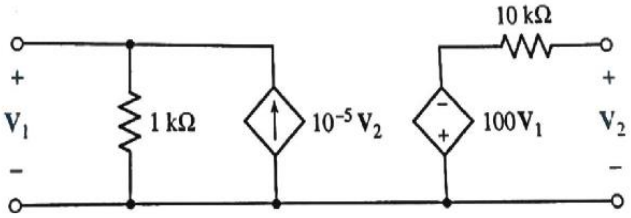
10 How can the time-domain behaviour of a circuit be determined from its pole-zero plots? Explain. 8

## MODULE-5

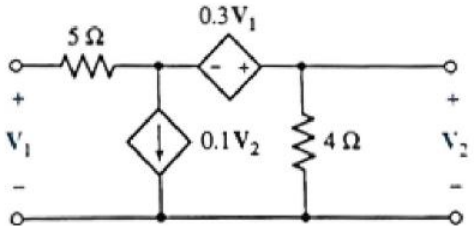
1. Explain the series and parallel connections of two port network. 8

2. Derive the interrelationship between transmission and hybrid two port network parameters. 6

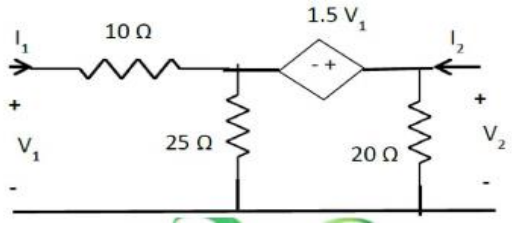
3. Calculate h parameters for the two-port network shown in figure. 7



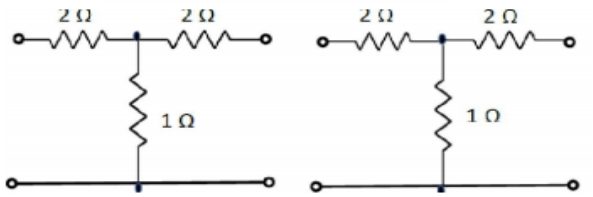

4. Calculate transmission parameters for the two-port network shown in figure. 7



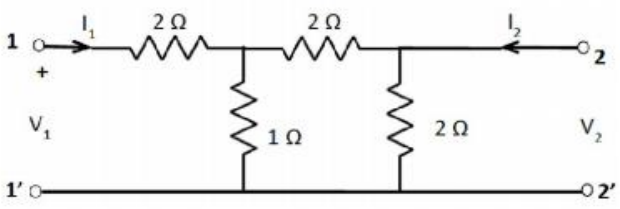

5. Find the transmission parameters for the two port network shown. 8




6. Two identical sections of a network shown in the figure are connected in series. obtain the Z parameters of the combination and verify by direct calculation 8

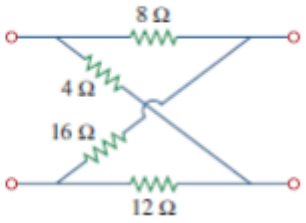



7. For the network shown ,derive the open circuit admittance parameters and draw its equivalent circuit 10




8. Express Z parameters in terms of hybrid and inverse hybrid parameters 10

9. Determine the $z$ and $y$ parameters for the circuit. 10



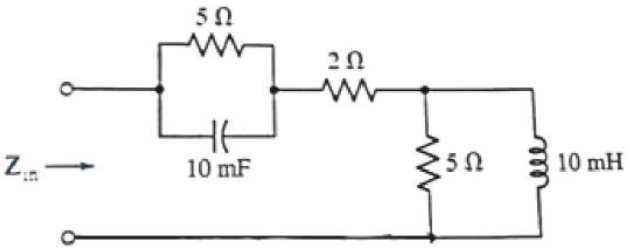

10 Explain the significance of image parameters of a two-port network. Define the following: (a) Characteristic impedance (b) Image impedances (c) Propagation constant. 10

11 Derive the resonance frequency for a series RLC circuit and give its power factor, current and voltage at resonance 10

12 A series RLC circuit has a quality factor of 5 at 50 rad/s. The current flowing through the circuit at resonance is 10A and the supply voltage is 100 V. Find the circuit constants R,L and C 10

## MODULE-6

1. For the network shown in figure find the resonant frequency. 6




2. Explain the following terms 6

(i) Bandwidth (ii) Q-factor (iii) Selectivity

3. Define resonance. Find the condition for resonance in a series RLC circuit 4

4. A series RLC circuit has R=25Ω, L=0.41H, C=0.01μF. calculate the resonant requency. If 1V source of the same frequency as the resonant resonant frequency is applied to this circuit, calculate the frequencies at which the voltage across L and C is maximum. Calculate the voltages. 8

5. Derive the expressions for resonant frequency, cut-off frequencies, bandwidth, Q factor of a series resonant circuit. 10

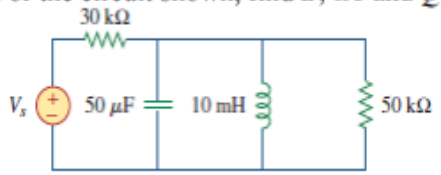
6. Analyse a single-tuned circuit and find the maximum output voltage possible for a given input. Also determine the critical value of mutual inductance. Repeat the same for a double-tuned circuit. 10

7. Two coils are mutually coupled, with L1 = 50 mH, L2 = 120 mH and k = 0.5. Calculate the maximum possible equivalent inductance if: 10

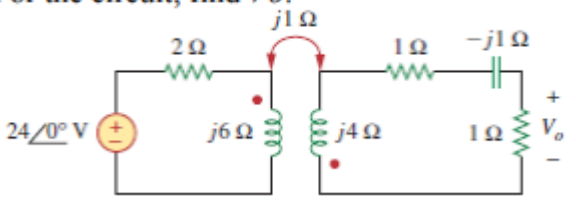
a. The two coils are connected in series

b. The coils are connected in parallel

8. For the circuit shown, find $B$, ωo and $Q$, as seen by the voltage across the inductor. 10




9. For the circuit, find $Vo$. 10




10. Briefly explain the dot convention used in the analysis of coupled circuits. 5

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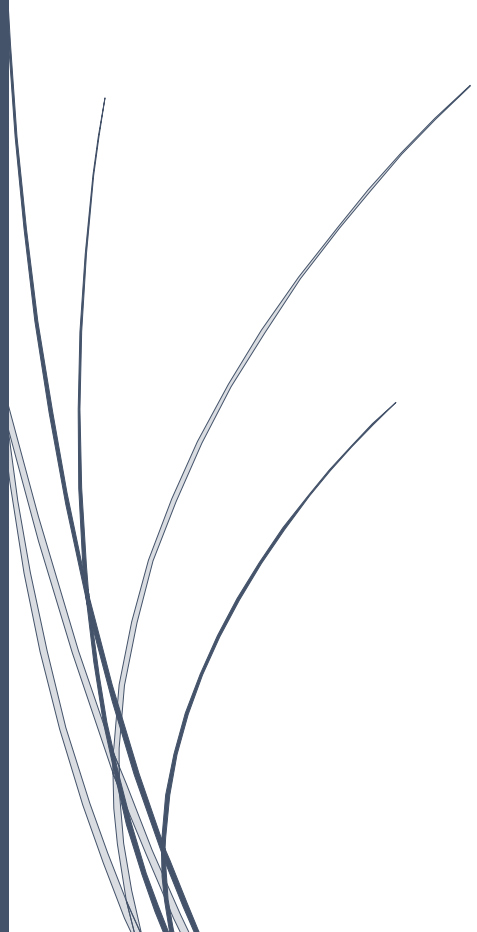
# EC 203 SOLID STATE DEVICES

***Faculty - Ms. Ashe Sudevan Bhaskaran***



## MODULE I

| | | |
|---|---|---|
| 1. | A silicon sample is doped with $10^{17}$ As atoms per $cm^3$.What is the equilibrium hole concentration at 300K? Where is Fermi level relative to the intrinsic energy level? | 10 |
| 2. | Derive the expression for drift current | 10 |
| 3. | A silicon sample is doped with $10^{17}$ boron atoms per $cm^3$.What is the equilibrium electron concentration at 300K.What is the resistivity. | 10 |
| 4. | Derive the expressions $p_0 = n_i e^{(E_i - E_F)/kT}$ and $n_o = n_i e^{(E_F - E_i)/kT}$ | 10 |
| 5. | Derive an expression for the electron diffusion current in a semiconductor | 10 |
| 6. | Describe Hall Effect. Consider a GaAs sample at T=300K with $N_d = 10^{16}$ per $cm^3$.Calculate the drift current density if the applied electric field is 10V per cm. | 10 |
| 7. | Calculate the equilibrium hole concentration in silicon at 300K.Assume that the Fermi level is 0.27eV above the valence band energy. The value of Nv for Si at T=300K is $1.04 * 10^{19}$ per $cm^3$ | 10 |
| 8. | What are the different scattering mechanisms in a semiconductor? How do they affect carrier mobility? | 10 |
| 9. | Derive the expression for mass action law. | 10 |
| 10. | Explain the temperature dependence of carrier concentration with extrinsic and intrinsic semiconductor with the help of a graph. | 10 |

## MODULE-2

| | | |
|---|---|---|
| 1. | Differentiate between direct recombination and indirect recombination. | 10 |
| 2. | Explain the types of indirect recombination. | 10 |
| 3. | Explain carrier lifetime. | 10 |
| 4. | Explain Luminescence. | 10 |
| 5. | Derive an expression for the electron diffusion current in a semiconductor | 10 |
| 6. | Derive Einstein relation. | 10 |
| 7. | Derive continuity equation. | 10 |
| 8. | Explain quasi-Fermi levels. | 10 |
| 9. | What are electrons and hole trappings? | 10 |
| 10. | Obtain an expression for the electron concentration under excess carrier generation. | 10 |

## MODULE-3

| | | |
|---|---|---|
| 1. | Derive Ideal diode equation. | 10 |
| 2. | Derive the expression for the electric field at the PN junction. | 10 |
| 3. | An abrupt Si pn junction has $N_a=10^{17}$ per $cm^3$on p side and $N_d=10^{16}$ per $cm^3$ on the n side.At 300 K calculate the Fermi levels ,draw an equilibrium band diagram and find contact potential from the diagram. Compare the result with potential calculated from equation. | 10 |
| 4. | What are real diodes? What are the factors that deviate the characteristics of a real diode from ideal diode. | 10 |
| 5. | Boron is implanted into a n -type Si sample ($N_d= 10^{16}$ per $cm^3$) forming an abrupt junction of square cross section with area= $2*10^{-3}$ $cm^2$. Assume that the acceptor concentration in P type region is $4*10^{18}$ per $cm^3$. Calculate contact potential, $X_{n0}$, $X_{p0}$, $Q^+$ and maximum electric field for the junction at equilibrium (300K). Sketch electric field and charge density. | 10 |
| 6. | Draw and explain the V-I characteristics of PN junction. | 10 |
| 7. | Explain the electron and hole component of current in forward biased p-n junction. | 10 |
| 8. | Explain the piecewise linear model of a diode. | 10 |
| 9. | Derive the expression for contact potential at the PN junction. | 10 |
| 10. | Draw and explain the charge density at an abrupt junction and a linearly graded junction. | 10 |

## MODULE-4

| | | |
|---|---|---|
| 1. | What are the differences between zener and avalanche breakdown? | 10 |
| 2. | Describe the capacitance of PN junction. Draw the energy band diagram of heterojunction. | 10 |
| 3. | Explain the switching transients of a diode. | 10 |
| 4. | Draw the band diagram for ohmic metal semiconductor contacts. | 10 |
| 5. | Explain the working of tunnel diodes. Draw its characteristics curve. | 10 |
| 6. | Explain Schottky barrier with band diagrams. | 10 |
| 7. | Explain about ohmic and rectifying contacts. | 10 |

| | | |
|---|---|---|
| 8. | Draw and explain the energy band diagram for a schottky barrier between p-type semiconductor and a metal having a smaller work function. | 10 |
| 9. | Explain the Fermi level pinning by interface states in compound semiconductor –metal junction. | 10 |
| 10. | Draw the V-I characteristics of a zener diode. Explain | 10 |

## MODULE-5

| | | |
|---|---|---|
| 1. | Define injection efficiency and base transport factor for BJT. How are they related to $\alpha$ and $\beta$. | 10 |
| 2. | Derive the emitter current and collector current of pnp BJT. Write the approximations used and approximated currents. | 10 |
| 3. | Explain the V-I characteristics of CB and CE configuration. | 10 |
| 4. | Explain base width modulation. | 10 |
| 5. | What are the mechanisms which cause base current in a transistor? | 10 |
| 6. | Draw the minority carrier distribution in PNP transistor during saturation and cut off mode. | 10 |
| 7. | Explain the amplification action of a transistor. | 10 |
| 8. | Explain the doping profile of BJT. | 10 |
| 9. | Explain the terms Avalanche multiplication,punch-through,base spreading. | 10 |
| 10. | Explain the current components in a BJT with a neat diagram. | 10 |

## MODULE-6

| | | |
|---|---|---|
| 1. | Plot the CV diagram of an ideal MOS capacitor & explain. | 10 |
| 2. | Explain the working of ideal MOS capacitor. | 10 |
| 3. | Derive the expression for drain current of MOSFET (square law model).Plot the V-I characteristics of a MOSFET. | 10 |
| 4. | Explain hot electron effect and subthreshold characteristics of MOSFET. | 10 |
| 5. | Explain the structure and operation of a FinFET. | 10 |
| 6. | Plot and explain the transfer characteristics of MOSFET. | 10 |
| 7. | Explain channel length modulation. | 10 |

| | | |
|---|---|---|
| 8. | Explain the term drain induced barrier lowering. | 10 |
| 9. | Differentiate between Enhancement type MOS Transistor and Depletion Type MOS Transistor. | 10 |
| 10. | Draw and explain the Energy-band diagram of MOS capacitor under various biasing conditions. | 10 |

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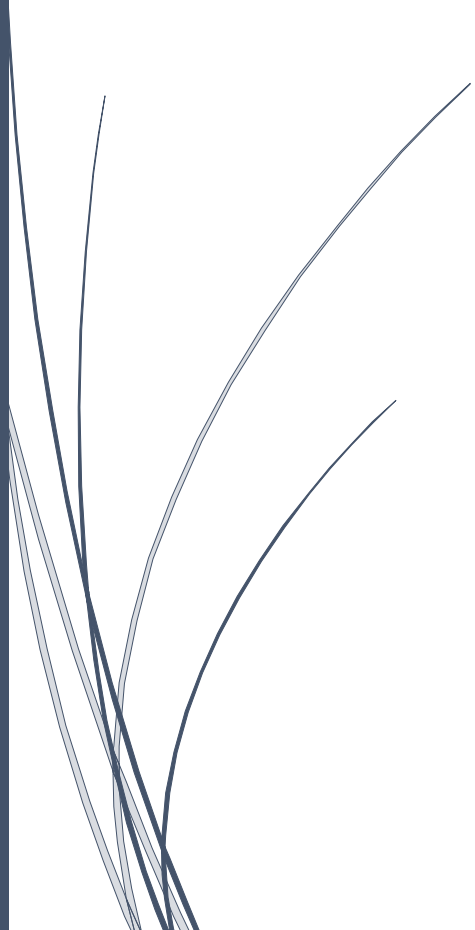
# EC 205 ELECTRONIC CIRCUITS

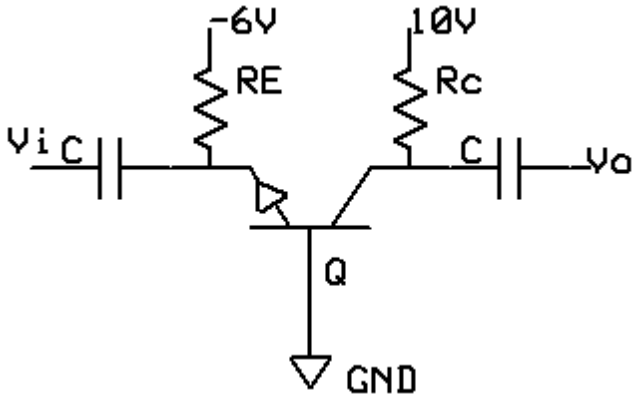
***Faculty – Ms. Anjana. N***



# MODULE I

| No | QUESTION | MARKS |
|---|---|---|
| 1 | Sketch the response of high pass circuit to a pulse input if RC/tp>>1 and RC/tp<<1 where tp is the time period of input pulse. | 4 |
| 2 | Explain the concept of DC load line of an amplifier. What is the significance of AC load line? | 3 |
| 3 | Design an integrator for an input square wave of frequency 1 KHz? | 3 |
| 4 | What are the factors that affect low and high frequency response of a RC coupled amplifier? How amplifiers are classified based on the position of operating point? | 10 |
| 5 | What are the major factors that affect the stability of a transistor amplifier and how the stability factors are defined?<br>Compare the input and output impedance of CE,CB and CC amplifiers. | 8 |
| 6 | What is the condition for an RC circuit to behave as an integrator?<br>Design a differentiator circuit to differentiate a square wave of 20V peak to peak<br>amplitude and 1.5KHz frequency. | 8 |
| 7 | For a fixed bias circuit, $V_{CC}$=10V, $R_B$ = 50K, $R_C$ = 500Ω. Assume silicon transistor with β=50 and $V_{BE}$ = 0.7V. Find the co-ordinates of Q point. | 6 |
| 8 | For a voltage divider network, $R_1$=36K, $R_2$ = 9K, $R_E$ =2K, $R_C$ =9K, $V_{CC}$= 24V,$V_{BE}$=0.7V. Calculate $I_C$ and $V_{CE}$ for β=100. | 6 |
| 9 | A square wave of peak to peak amplitude 4V extending ±2V with respect to ground is applied to a low pass RC circuit. The duration of positive section is 0.2sec and that of negative section is 0.1sec. Plot the output waveform. The time constant of the circuit is 0.2sec. | 7 |
| 10 | Define the 3 stability factor of CE amplifier and derive expression for the current stability factor of a potential divider bias CE amplifier circuit. | 8 |
| 11 | How amplifiers are classified based on their Q points? Explain showing the positions of the Q points on the respective load lines and current transfer characteristics curves for at least 3 types of classes. Also compare their merits and demerits. | 8 |
| 12 | Draw the circuit of a high pass RC circuit. Plot the response for a square input. | 10 |
| 13 | Under what condition, a high pass RC circuit can be used as a differentiator? | 4 |
| 14 | For a low pass circuit, input is a square wave of 4 V peak to peak, the duration of positive section is 0.2 sec and that of negative section is 0.1 second. Plot the output waveform to scale. Given the time constant of the circuit as 0.2 second | 8 |
| 15 | Explain how amplifiers are classified based on the method of coupling used. | 3 |

# MODULE II

| | | |
|---|---|---|
| 16 | Draw the hybrid π small signal low frequency model for CE configuration and derive the expression for input and output impedances. | 7 |
| 17 | With a hybrid π small signal low frequency equivalent circuit derive the expression for Current and voltage gain of a CE transistor amplifier. | 9 |
| 18 | What is cascade amplifier? | 3 |
| 19 | Prove that for an emitter follower circuit gain is approximately one. | 7 |
| 20 | Derive Input impedance and Voltage gain of a Common Emitter Amplifier with emitter bypassed for the mid frequency range using hybrid π model. | 6 |
| 21 | For the circuit shown, calculate input impedance, output impedance and voltage gain for the mid frequency range using hybrid π model. $R_E$=6.8K, $R_C$=4.7K, α =0.99.   | 8 |
| 22 | Define the small signal hybrid parameters of a CE configuration. Show how to determine their values from the characteristics. | 8 |
| 23 | Drw the circuit of two-stage RC coupled amplifier. Derive expressions for its effective lower cut-off frequency and effective upper cut-off frequency. If the individual stages are having $f_L$=20Hz and $f_H$=200kHz, calculate the respective values for the cascaded two-stage. | 7 |
| 24 | Discuss hybrid equivalent model of CB,CE,CC configurations | 7 |
| 25 | Draw the approximate small signal model of a transistor in VCCS and CCCS modes. Give the significance of each component. | 5 |
| 26 | For a common emitter (emitter bypassed) amplifier, VCC =9V, RE=1.2KΩ, R1=27KΩ, R2=15K Ω, RS=10K Ω, RL=2KΩ, RC=2.2KΩ. For the transistor β =100, VBE=0.7V and VA=100V. Determine input resistance, output resistance, voltage gain and current gain. Also determine the voltage gain by taking source resistance into consideration. | 10 |
| 27 | Draw the circuit of a CB amplifier and derive expressions for voltage gain and input resistance. | |
| 28 | An NPN BJT amplifier has been biased using potential divider. The Q points are IC = 1 mA and VCE = 5V. Given VCC = 20V, VRE = 3V, β = 100 and VBE = 0.6V. For a stability factor of 5, design the bias circuit. | |

## MODULE III

| | | |
|---|---|---|
| 29 | Draw the small signal high frequency hybrid π model of a transistor in Common Emitter configuration and derive the expression for short-circuit current gain. | 7 |
| 30 | Draw the circuit of a typical cascode connection and explain its main features. | 8 |
| 31 | Draw the short circuit current gain versus frequency plot on a log scale and mark fβ and fT on the plot. What is meant by short circuit current gain-bandwidth product? | 6 |
| 32 | Derive expression for short circuit current gain in terms of frequency of operation. | 6 |
| 33 | Calculate the bandwidth fβ and capacitance Cπ of a BJT whose fT = 500MHz at IC = 1mA, β = 100 and Cμ = 0.3Pf. | 6 |
| 34 | Explain Miller's theorem. Draw the circuit of a cascode amplifier and briefly explain its features. | 9 |
| 35 | What are the physical orgins of resistances in the high frequency hybrid π model of a CE transistor amplifier? Explain the different parameters in the hybrid π circuit. | 7 |
| 36 | Deduce the high frequency equivalent circuit of a potential divider bias CE amplifier circuit. Derive the expression for the CE short circuit current gain as a function of frequency. Explain with frequency response characteristics diagram, the relationship between $f_\beta$ and $f_t$. | 12 |
| 37 | Draw the circuit of a cascode amplifier and explain its properties. | 5 |
| 38 | An amplifier with open loop gain of 1000 delivers 10 W of output power at 10% of second harmonic distortion when the input is 10 mV. If 40 dB negative feedback is applied and the output power to remain the same, determine (i) required input voltage (ii) percentage second harmonic distortion. | 8 |
| 39 | Explain briefly the various broad-banding techniques in an amplifier | 7 |
| 40 | Draw the circuit of a cascode amplifier. Derive the expression for mid-band gain and pole frequencies. | 11 |
| 41 | A BJT is biased at IC = 0.25 mA. The parameters are β0 = 100 and and Cμ= 0.1 pF. The β cut-off frequency is 11.5 MHz. Determine Cπ | 4 |

## MODULE IV

| | | |
|---|---|---|
| 42 | Sketch the topology for the generalized resonant circuit oscillator, using impedances z1,z2 and z3. Derive the expression for the frequency of oscillation. Under what condition does the configuration reduce to Colpitts oscillator? | 10 |
| 43 | Derive the equation which shows that the sensitivity of an amplifier reduces by applying negative feedback to the circuit. | 5 |
| 44 | Make a distinguish between voltage feedback and current feedback in amplifier circuits. Discuss the merits in each case and derive expressions for the net output resistance in each case. | 8 |

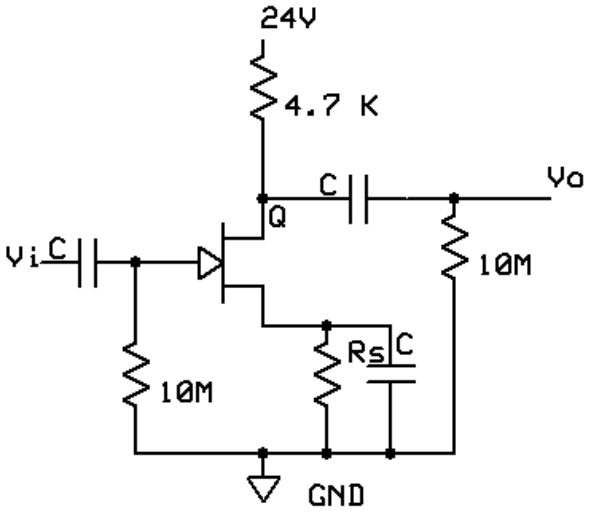
| | | |
|---|---|---|
| 45 | What is Barkhausen criterion for sustained oscillations? Derive the expression for frequency and gain of a Wein bridge oscillator. | 8 |
| 46 | What is the significance of gain-bandwidth product? Draw the circuit of a RC phase shift oscillator and design the circuit for an output frequency of 10KHz. | 9 |
| 47 | Draw the circuit of a tuned amplifier and explain the working. Draw the feedback amplifier topologies clearly indicating the currents, voltages, transfer gain and feedback factor. | 8 |
| 48 | Draw the circuit diagram of a RC phase shift oscillator and explain its working. Derive the expression for frequency of oscillation. | 10 |
| 49 | Explain how negative feedback acts on gain, distortion, stability and frequency response of a circuit. | 9 |
| 50 | Discuss the variation of input and output resistance on voltage series and current shunt feedback. | 6 |
| 51 | Draw the feedback amplifier topologies clearly indicating the currents , voltages,transfer gain and feedback factor. | 4 |
| 52 | Explain how negative feedback acts on gain, distortion , stability and frequency response of a circuit. | 9 |
| 53 | Draw the circuit of a Wien bridge oscillator and explain. Derive the expression for its frequency of oscillation.<br>• Compare RC and LC oscillators.<br>• Compare stagger tuning and synchronous tuning. | 15 |

## MODULE V

| | | |
|---|---|---|
| 54 | Draw the circuit diagram of collector coupled astable multivibrator and explain its operation with neat waveforms. | 10 |
| 55 | Show the maximum efficiency of a class B power amplifier is 78.5%. What is crossover distortion? How it can be eliminated? | 8 |
| 56 | Draw the circuit of a class AB power amplifier and explain the working. | 6 |
| 57 | Draw the circuit of a Schmitt trigger and explain the working. | 6 |
| 58 | Explain the working of an astable multivibrator circuit with a neat circuit diagram and waveforms. Derive an expression for period of oscillation. | 10 |
| 59 | For a series fed class A amplifier, $R_B$ =1K, $R_C$ =20Ω and $V_{CC}$ = 20V. β for BJT is25. Calculate the input power, output power and conversion efficiency for an input voltage resulting in a base current of 10mA peak. | 7 |
| 60 | Compare Class A, Class B and Class AB power amplifiers. | 6 |
| 61 | Explain the working of bootstrap circuit with a neat circuit diagram and waveforms. | 7 |
| 62 | A class B push pull power amplifier is supplied with $V_{CC}$= 50V. the signal swings the collector voltage down to $V_{min}$= 5V . The total dissipation in both transistor is 40W. calculate the total output power and conversion efficiency. | 8 |
| 63 | Draw the circuit diagram of monostable multivibrator and explain its operation with neat waveforms. | 10 |

| | | |
|---|---|---|
| 64 | Draw the circuit of a class B push-pull amplifier and explain its operation. What is its drawback? How it can be overcome? | 9 |
| 65 | Explain the working of Schmitt trigger circuit with relevant waveforms. Obtain expressions for UTP and LTP. | 11 |
| 66 | Design an astable multivibrator for a period of oscillation of 5 kHz. Use a transistor with $\beta = 100$, $V_{BE(sat)} = 0.7V$, $I_C = 3$ mA and $V_{CE(sat)} = 0.2V$. | 6 |

## MODULE VI

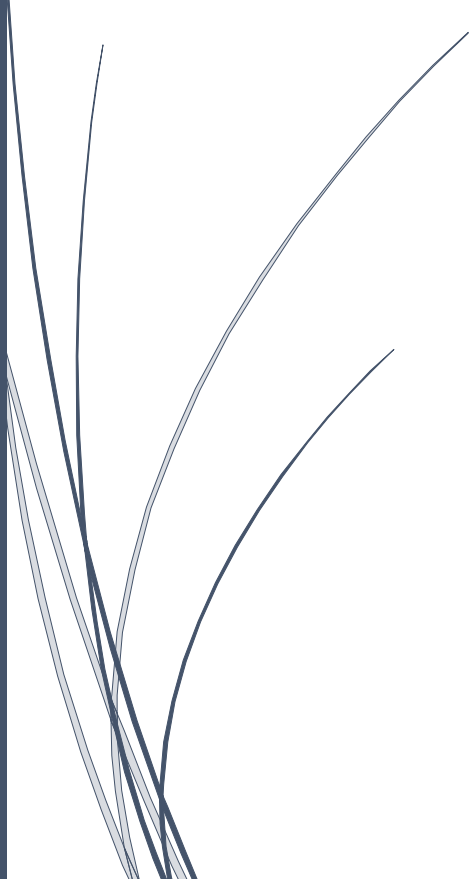
| | | |
|---|---|---|
| 67 | For the circuit shown, $I_{DSS}$= 5mA, gmo = 2500μS. If Rs = 820Ω, what is $I_D$, $V_{GS}$ and $V_{DS}$.   | 10 |
| 68 | Derive expressions for voltage gain and output resistance for a common source<br>Amplifier with source bypassed using small signal model in mid frequency. | 8 |
| 69 | With a neat circuit diagram, explain how output voltage can be regulated by using series feedback voltage regulator. How short circuit protection can be implemented in this? | 8 |
| 70 | Draw the circuit of a series voltage regulator with error amplifier and explain the working. | 6 |
| 71 | Suggest one scheme to incorporate short circuit protection in a series regulator. | 4 |
| 72 | Design a series voltage regulator with error amplifier having the following specification Output voltage-5 volts Maximum load current -100mA Input voltage range 7 – 12 volts (Make suitable assumptions) | 10 |
| 73 | With the help of low frequency and high frequency equivalent circuit derive the expression for voltage gain at low and high frequencies. | 10 |
| 74 | Draw the circuit of a Drain feedback bias circuit for E-MOSFET. Explain its working and properties. | 8 |
| 75 | Draw the circuit of a series pass voltage regulator which uses a feedback. Explain its working when the input voltage as well as load current varies. Design the circuit to deliver 6V, 100mA maximum load current. | 12 |
| 76 | Draw the circuit of a common source amplifier using MOSFET. Derive the expressions for voltage gain and input resistance. | 8 |

| | | |
|---|---|---|
| 77 | Design a Zener regulator for the following specifications: unregulated input 15-30V, output voltage = 10V, load current 0-100mA. Assume that the Zener stabilizes at a minimum current of 10mA. | 8 |
| 78 | Compare series and shunt regulators. | 4 |
| 79 | Draw the circuit of a series voltage regulator and explain its operation clearly. Discuss how short circuit protection can be provided in the circuit | 9 |
| 80 | Explain how a transistor can be used as a switch? | 5 |

2018 Batch S3
(2018-2022)

# EC 207 LOGIC CIRCUIT DESIGN

***Faculty – Ms. Anagha.A.S***



| | LOGIC CIRCUIT DESIGN | Marks |
|---|---|---|
| | **MODULE I** | |
| 1 | (a) Convert the following (i) (AB6)16 to Decimal<br>(ii)(543.26)10 into Octal<br>(iii) (247.36)8 into Hexa Decimal<br>(iv)(AF9.B0D)16 into Binary<br>(b)Consider the signed binary numbers A = 01000110 and B = 11010011 where B is in 2's complement form. Find the value of the following mathematical expression (i) A + B (ii) A - B (iii) B -A | 15 |
| 2 | a) Convert 326.87510 to binary, and Hex form.<br>b) Represent 47810 in BCD and Excess-3 codes.<br>c) Perform the arithmetic operation on these unsigned binary numbers. Show intermediate steps.<br>i) 10110.101+101.11 (ii) 100001-1011 | 3+3+4 |
| 3 | a) A computer system uses 12 bits. What is the counting range of values, in decimal form, if the 12 bits are used to represent i) unsigned numbers only (ii) 2's complement system (iii) 1's complement system.<br>b) Perform arithmetic operation on the given decimal numbers using 2's complement system. Use 8 bits for each number including sign bit. Express the result in binary form. : 15 - 4 | 5+4 |
| 4 | (a) Convert the following<br>(i) (AB6)16 to Decimal (iii) (543.26)10 into Octal<br>(ii) (247.36)8 into Hexa Decimal (iv) (AF9.B0D)16 into Binary<br>b) Consider the signed binary numbers A = 01000110 and B = 11010011 where B is in 2's complement form. Find the value of the following mathematical expression<br>(i) A + B<br>(ii) A - B<br>(iii) B - A | 8+7 |
| 5 | Hamming code was used to generate parity for a nibble. If received bit sequence is 0101010 then write correct bit sequence with (i) Even parity (ii) Odd parity | 8 |
| 6 | a) Convert the following numbers to the base indicated:<br>i) (1542)8 to base 10 ii) 52.35)10 to base 2<br>iii) (AD.4)H to base 8 iv) (1456.125)10 to base 16<br>b) Perform the following binary arithmetic using 1's complement and 2'scomplement.<br>i) 76.75 - 146.625 ii) 77.5 – 34.25 | 6+8 |
| 7 | How is the Hamming code word generated? The message "1001001" is coded in e 7-bit even parity Hamming code, which is transmitted through a noisy channel. code the message, assuming that at most a single error occurred in each code ord. | 5 |
| 8 | Prepare a table for the first 12 integers in Binary, Grey, Excess 3 and ASCII. | 10 |

| | | |
|---|---|---|
| 9 | Perform the following operations [showing the intermediate steps].<br>i) $11000_2 - 10111_2$ using 1's and 2's complement method<br>ii) $7461_8 + 7157_8$<br>iii) DC5A16 – 9B3C16<br>iv) $11001001101.1011011_2$ into Decimal, Octal and Hexadecimal | 10 |
| 10 | Represent $478_{10}$ in BCD & Excess-3 code | 5 |
| 11 | Explain Duality principle with examples | 3 |
| 12 | What are error detection and correcting codes | 5 |

## MODULE II

| | | |
|---|---|---|
| 13 | (a)Simplify using K-map<br>F(a,b,c,d) = ∑m (4,5,7,8,9,11,12,13,15)<br>b) Explain the operation of a 8x1 multiplexer and implement the following using an 8x1 multiplexer<br>F(A, B, C, D) = ∑ m (0, 1, 3, 5, 6, 7, 8, 9, 11, 13, 14) | 5+10 |
| 14 | A function is defined as F(a,b,c,d) = a'b+a'c+c'+a'd+a'b'c'+a'bc'<br>i) Express the function in standard SOP (canonical) form.<br>ii) Implement the function using single 8:1 MUX.<br>iii) Simplify the function using K-map and implement the result using NAND gates only. | 10 |
| 15 | Design the circuit of a 3-line to 8-line decoder using basic gates. | 6 |
| 16 | a) Minimize the following logic function using K- maps and realize using NAND gates alone<br>F(A, B, C, D) = ∑ m (0, 3, 5, 8, 9, 11,15) + d (2, 3)<br>b) Design a magnitude comparator to compare two 2-bit numbers A = A1A0 and B = B1B0 | 10+5 |
| 17 | Using K map design a 3 bit Binary to Gray code converter. | 10 |
| 18 | A) Implement the following Boolean function using 8:1 Multiplexer.<br>F(A,B,C,D)= A'B'C'+BC'D'+A'CD+ACD' | 7 |
| 19 | plain BCD to 7 segment decoder | 10 |
| 20 | Draw the gate level circuit diagram and logic equations for a 1 to 4 de-multiplexer. For the Boolean function F = (A + B). (A + C). (B + C). Show how it can be implemented using a 1: 8 de-multiplexer and one or more gates. | 10 |
| 21 | (a)State and explain demorgans theorem<br>(b)A four variable Boolean function is given as F = A. B. C + A. C'. D + B. C. D where AB C'D' + AB'CD + A'B'CD are don't cares. Use Karnaugh map to find | 5+10 |

| | | |
|---|---|---|
| | the minimal SOP expression for F. Design and realize the function Fi) using NAND gates only and ii) using NOR gates only. | |
| 22 | Using K-map derive the reduced Boolean expression for the following function f(A,B,C,D) = $\sum m(0,1,3,4,6,9,11) + d(2,5)$ | |

## MODULE III

| | | |
|---|---|---|
| 23 | a) Draw the circuit diagram of a standard 2 input CMOS NOR gate with 5V supply voltage. How does it work as a NOR gate. Write its truth table.<br>b) What are noise immunity and noise margin? Indicate the logic levels of the 5V CMOS and TTL gates. | 10 |
| 24 | a)What is open-collector output gate? State its use.<br>What is tri-state logic? State its use.<br>b) What is PLA? Showhow f1= a'bc+ab'+abc', f2= a'b'c'+ac and f3= ab'c+ab can be implemented in PLA. | 10+10 |
| 25 | a) Draw the circuit and explain the operation of TTL NAND gate<br>b) Compare TTL, CMOS logic families in terms of fan-in, fan-out, supply voltage, propagation delay, power dissipation and noise margin | 10+5 |
| 26 | Implement the following function using PLA<br>F1(x, y, z) = ∑ m ( 1, 2, 4, 6 )<br>F2(x, y, z) = ∑ m (0, 1 , 6, 7) | 8 |
| 27 | a) Draw the circuit diagram of CMOS NOR gate and explain the working with truthtable.<br>b) Implement the following functions using PLA.<br>$F_1$=Σm(3,5,7)<br>$F_2$= Σm(4,5,7)<br>c) Define the terms noise margin, propagation delay and power dissipation of logic families. Compare TTL and CMOS logic families showing the values of above mentioned terms. | 5+7+ 10 |
| 28 | Design the circuit of a mod-12 asynchronous up counter using JK flip-flop that starts counting at 0. Draw its output waveforms and indicate the sequence.<br>Design an additional circuit to light an LED when the count is maximum. | 10 |
| 29 | (a)Draw & Explain TTL NAND gate<br>(b)What is PLDs? Differentiate between PAL and PLA. | 8+5 |
| 30 | With neat diagram, Explain the operation of BCD adder circuit | 5+5 |
| 31 | Draw the circuit diagram of a transistor level TTL NOT gate and explain the working with a truth table | |

## MODULE IV

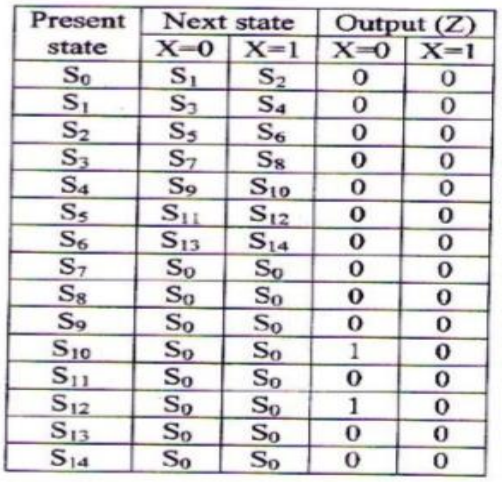
| | | |
|---|---|---|
| 32 | Design a 3-bit synchronous counter using D Flip Flop | 10 |
| 33 | a) Explain a MOD 6 asynchronous counter using J K Flip Flop<br>b) Convert SR Flip Flop into J K Flip Flop | 7+5 |
| 34 | a) Realize a T flip-flop using NAND gates and explain the operation with truth table,excitation table and characteristic equation.<br>b) What is race around condition? How it is avoided? | 5+3 |

| | | |
|---|---|---|
| 35 | Design the circuit of a mod-12 asynchronous up counter using JK flip-flop that starts counting at 0. Draw its output waveforms and indicate the sequence.<br>Design an additional circuit to light an LED when the count is maximum. | 10 |
| 36 | Design a 3-bit synchronous up counter using T Flip-flop with outputs Q2Q1Q0 where Q0 is LSB. Write the complete truth table and excitation table. Derive the expression of T2, T1, T0 in terms of Q2 ,Q1, Q0. Draw the circuit diagram. | 10 |
| 37 | sign a MOD-6 synchronous counter using JK flip-flop. When the counter enters an unused state, the counter has to start counting from 0. Draw the timing diagram and complete logic diagram. | 10 |
| 38 | Draw the state diagram, transition table, D flip flop excitation table and state equation for the given state table (Figure1) | 10 |
| 39 | Explain master slave JK flip-flop with neat diagram | 10 |
| 40 | Describe the procedure for converting one flip-flop to another. Do the following conversions<br>a. T to JK<br>b. T to D | 10 |
| 41 | A serial data line carries binary data to a system with input X. The system is required to detect a sequence 0 1 0 in the data and give an output Y = 1 at the end of the sequence. Only non-overlapping sequences should be detected in the data. For example, the output y should only be 1 for the 0 underlined in the input sequence : : : 1 0 1 <u>0</u> 1 0 1 <u>0</u> : : :. Draw the state diagram, state table, transition table, excitation table for the Mealy clocked synchronous sequential system and realize it with minimum number of D-flip flops after state reduction, if possible | 10 |

| Present state | Next state | | Output (Z) | |
|---|---|---|---|---|
| | X=0 | X=1 | X=0 | X=1 |
| A (00) | A | B | 0 | 0 |
| B (01) | C | B | 0 | 0 |
| C (10) | A | D | 0 | 0 |
| D (11) | C | B | 1 | 0 |

## MODULE V

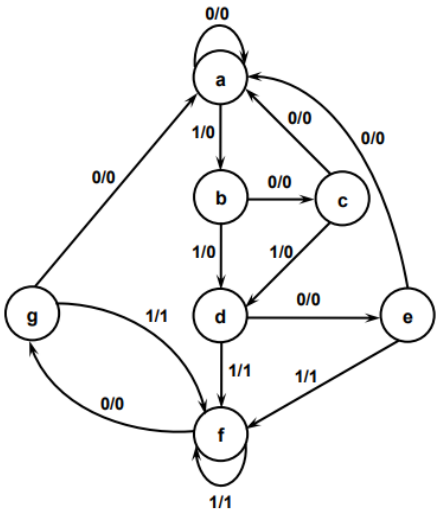
| | | |
|---|---|---|
| 42 | Draw the logic diagram of 3 bit PIPO shift register with LOAD/SHIFT control and explain its working. | 10 |
| 43 | Explain Moore and Mealy machine models. Compare the models | 5 |

| | | |
|---|---|---|
| 44 | Draw the logic diagram of 3 –bit Johnson counter and explain the working with truth table. | 10 |
| 45 | With the logic diagram explain the working of a four bit bi-directional Serial in Serial out (SISO) shift register with mode control. | 10 |
| 46 | Draw the logic diagram of a 4-bit ring counter and explain the working with timing diagram. | 10 |
| 47 | Design a 4-bit bi-directional shift register circuit using D flip-flops with shift control input M that shifts right when M=1 and shifts left when M=0. State how it works with examples. | 10 |
| 48 | Reduce the state table & identify the redundant states<br>  | 10 |
| 49 | Design a MOD-12 asynchronous counter (ripple counter) using JK flip flop. Explain the working with truth table and timing diagram. | 10 |

| Present state | Next state | | Output (Z) | |
|---|---|---|---|---|
| | X=0 | X=1 | X=0 | X=1 |
| $S_0$ | $S_1$ | $S_2$ | 0 | 0 |
| $S_1$ | $S_3$ | $S_4$ | 0 | 0 |
| $S_2$ | $S_5$ | $S_6$ | 0 | 0 |
| $S_3$ | $S_7$ | $S_8$ | 0 | 0 |
| $S_4$ | $S_9$ | $S_{10}$ | 0 | 0 |
| $S_5$ | $S_{11}$ | $S_{12}$ | 0 | 0 |
| $S_6$ | $S_{13}$ | $S_{14}$ | 0 | 0 |
| $S_7$ | $S_0$ | $S_0$ | 0 | 0 |
| $S_8$ | $S_0$ | $S_0$ | 0 | 0 |
| $S_9$ | $S_0$ | $S_0$ | 0 | 0 |
| $S_{10}$ | $S_0$ | $S_0$ | 1 | 0 |
| $S_{11}$ | $S_0$ | $S_0$ | 0 | 0 |
| $S_{12}$ | $S_0$ | $S_0$ | 1 | 0 |
| $S_{13}$ | $S_0$ | $S_0$ | 0 | 0 |
| $S_{14}$ | $S_0$ | $S_0$ | 0 | 0 |

## MODULE VI

| | | |
|---|---|---|
| 50 | Design a 101 sequence detector ,for overlapping case, using D Flip Flop | 10 |
| 51 | For the given state diagram, design a sequential circuit with D flip flops<br><br>(i) Construct the state table.<br>(ii) Obtain the simplified input equations for all input flip flops and the | 10 |
| 52 | Obtain the state diagram for a sequence detector to detect the sequence 1010,generate the state table, transition table, excitation table and implement using D flip flop. When the sequence is detected output z = 1, overlapping of sequence is permitted. | 20 |
| 53 | Minimize the state table using implication chart. The state machine is having nine states, one input and two output variables. Re-assign the simplified state variables as A, B, C, D and E. | 8 |

| | | |
|---|---|---|
| | <table><tr><th rowspan="2">Present state</th><th colspan="2">Next state</th><th colspan="2">Output ($Z_1Z_2$)</th></tr><tr><th>X=0</th><th>X=1</th><th>X=0</th><th>X=1</th></tr><tr><td>0</td><td>0</td><td>1</td><td>00</td><td>00</td></tr><tr><td>1</td><td>4</td><td>2</td><td>00</td><td>00</td></tr><tr><td>2</td><td>7</td><td>1</td><td>00</td><td>00</td></tr><tr><td>3</td><td>2</td><td>6</td><td>01</td><td>10</td></tr><tr><td>4</td><td>6</td><td>5</td><td>10</td><td>00</td></tr><tr><td>5</td><td>3</td><td>4</td><td>01</td><td>11</td></tr><tr><td>6</td><td>1</td><td>6</td><td>01</td><td>10</td></tr><tr><td>7</td><td>3</td><td>8</td><td>10</td><td>00</td></tr><tr><td>8</td><td>8</td><td>7</td><td>01</td><td>11</td></tr></table> | |
| 54 | Design a 3-bit up/down synchronous counter using JK Flip-flop that counts up when the control input M=1 and counts down when M=0. Assume that JK flip-flop inputs are J2K2, J1 K1 ,J0 K0 and the corresponding outputs are Q2 Q1 Q0 respectively where Q0 is LSB. Draw its State table, Excitation Table and Logic diagram | 10 |
| 55 | Design a counter that has the following repeated binary sequence: 0, 1, 2, 3, 4, 5, 6, 7. | 10 |
| 56 | Reduce the sequential circuit using the given state diagram.<br>  | 10 |
| 57 | Explain sequence detector with example | 10 |
| 58 | Design a circuit to obtain the sequence 2; 4; 3; 6; 2; 4; : : : using JK flip flops | 10 |
| 59 | Reduce the state using implication chart | 10 |

| Present State | Next State $X = 0$ | 1 | Present Output |
|---|---|---|---|
| $a$ | $d$ | $c$ | 0 |
| $b$ | $f$ | $h$ | 0 |
| $c$ | $e$ | $d$ | 1 |
| $d$ | $a$ | $e$ | 0 |
| $e$ | $c$ | $a$ | 1 |
| $f$ | $f$ | $b$ | 1 |
| $g$ | $b$ | $h$ | 0 |
| $h$ | $c$ | $g$ | 1 |

2018 Batch S3
(2018-2022)

# MA201 LINEAR ALGEBRA & COMPLEX ANALYSIS

***Faculty – Ms. Gopika. G***

## Module I

| Sl. No | Questions | Marks | KTU |
|---|---|---|---|
| 1. | Show that $u = y^3 - 3x^2y$ is harmonic and hence find its harmonic conjugate. | 8 | DEC 2016 |
| 2. | Define an analytic function and prove that an analytic function of constant modulus is constant. | 8 | DEC 2016 |
| 3. | Check whether the following functions are analytic or not. Justify your answer<br>i) $f(z) = z + \bar{z}$<br>ii) $f(z) = \|z\|^2$ | 4+4 | MARCH2017 |
| 4. | Show that $f(z) = \sin z$ is analytic for all z. Find $f'(z)$ | 7 | MARCH2017 |
| 5. | Show that $v = 3x^2y - y^3$ is harmonic and find the corresponding analytic function | 8 | MARCH2017 |
| 6. | . Let $f(z) = u(x, y) + i\, v(x, y)$ be defined and continuous in some neighbourhood of a point z = x+ iy and differentiable at z itself. Then prove that the first order partial derivatives of u and v exist and satisfy Cauchy- Reimann equations | 7 | ARIL 2018 |
| 7. | Prove that $u = \sin x \cosh y$ is harmonic.Hence find its harmonic conjugate. | 8 | ARIL 2018 |
| 8. | Check whether the function f(z) = $\frac{Re\,(z^2)}{\|z\|^2}$ if z ≠ 0 = 0 if z = 0 is continuous at z=0 | 7 | ARIL 2018 |
| 9. | Let f (z) = u+ iv is analytic ,prove that u = constant,v=constant are families of curves cutting orthogonally. | 7 | JULY2017 |
| 10 | Prove that the function u(x, y) = $x^3 - 3xy^2 - 5y$ is harmonic everywhere . Also find the harmonic conjugate of u. | 7 | JULY2017 |
| 11 | Find the points, if any, in complex plane where the function f(z)=$2x^2 + y + i(y^2 - x)$is (i) differentiable( ii) analytic | 8 | JULY2017 |
| 12 | Find the analytic function whose imaginary part is v($x$,$y$) = $log(\, x^2 + y^2\,) + x - 2y$. | 7 | MAY 2019 |

## Module II

| | | | |
|---|---|---|---|
| 1. | Find the image of $\left\|z - \frac{1}{2}\right\| \leq \frac{1}{2}$ under the transformation $w = \frac{1}{z}$ .Also find the fixed points of the transformation $w = \frac{1}{z}$ | 7 | DEC2016 |
| 2. | Find the linear fractional transformation that maps the points $z_1 = 0\,, z_2 = 1\,, z_3 = \infty$ onto $w_1 = -1\,, w_2 = -i\,, w_3 = 1$ respectively. | 7 | DEC2016 |

| | | | |
|---|---|---|---|
| 3. | Find the image of the lines x = c and y = k where c and k are constants under the transformation w = $sin\ z$ | 7 | DEC2016 |
| 4. | Find the image of $0 < x < 1$ , $\frac{1}{2} < y < 1$ under the mapping w $= e^z$ | 7 | MARCH2017 |
| 5. | Find the linear fractional transformation that carries $z_1 = -2$ , $z_2 = 0$ and $z_3 = 2$ onto the points $w_1 = \infty$ $w_2 = \frac{1}{4}$ ,$w_3 = \frac{3}{8}$ hence find the image of x axis | 7 | MARCH2017 |
| 6. | Find the image of the rectangular region $-\pi \leq x \leq \pi$ , $a \leq y \leq b$ under the mapping $w = sin\ z$ | 8 | MARCH2017 |
| 7. | Find the image of the region $\left\|z - \frac{1}{3}\right\| \leq \frac{1}{3}$ under the transformation $w = \frac{1}{z}$ | 8 | APRIL 2018 |
| 8. | Find the image of the x axis under the linear fractional transformation $w = \frac{z+1}{2z+4}$ | 8 | APRIL 2018 |
| 9. | Under the transformation $w = z2$, find the image of the triangular region bounded by = 1, $y = 1$ and $x + y = 1$. | 8 | MAY 2019 |
| 10. | Find the bilinear transformation that maps the points $-1, i, -1$ onto $i, 0, -i$. | 8 | MAY 2019 |
| 11. | Find the image of the half plane Re(z)≥ 2,under the map w=iz | 8 | JULY 2017 |
| 12. | Under the transformation $w = 1/z$ , find the image of $\|z - 2i\| = 2$. | 8 | MAY 2019 |

**Module III**

| | | | |
|---|---|---|---|
| 1 | Evaluate $\int_c Re(z)\ dz$ where is the straight line from 0 to 1+2i | 7 | DEC2016 |
| 2 | Show that $\int_0^\infty \frac{1}{1+x^4}\ dx = \frac{\pi}{2\sqrt{2}}$ | 8 | DEC2016 |
| 3 | Integrate $\frac{z^2}{z^2-1}$ counter clockwise around the circle \|z_1_i\|=$\frac{\pi}{2}$ | 7 | DEC2016 |
| 4 | Evaluate $\int_c \|z\|\ dz$<br>i)where c is the line segment joining i and –i<br>ii) where c is the unit circle in the left of the half plane | 3+4 | MARCH2017 |
| 5 | Verify Cauchy's integral theorem for $z^2$ taken over the boundary of the rectangle with vertices -1,1,1+i,1-I in the counter clockwise sense. | 8 | MARCH2017 |
| 6 | Evaluate $\int_c Im(z^2)\ dz$ where c is the triangle with vertices 0,1,i counter clockwise. | 7 | APRIL 2018 |

| | | | |
|---|---|---|---|
| 7 | Use Cauchy's Integral Formula, evaluate $\int_c \frac{z^2}{z^3-z^2-z+1}\,dz$ where c is taken counter clockwise around the circle:<br>i)$\|z+1\|=\frac{3}{2}$ ii)$\|z-1-i\|=\frac{\pi}{2}$ | 8 | APRIL 2018 |
| 8 | Find the Taylor series and Laurent series of $f(z)=\frac{-2z+3}{z^2-3z+2}$ with centre 0 in<br>i)$\|z\|<1$ ii1$<\|z\|<2$ | 8 | APRIL 2018 |
| 9 | Find the Laurent series expansion of $f(z)=\frac{1}{1-z^2}$ which is convergent in<br>i)$\|z-1\|<2$ ii) $\|z-1\|>2$ | 8 | MARCH2017 |
| 10 | If $(z)=\frac{1}{z^2}$, find the Taylor series that converges in $\|z-i\|<R$ and the Laurent series that converges in $\|z-i\|>R$ | 8 | DEC 2016 |
| 11 | Using Cauchy's integral formula, evaluate $\int_c \frac{e^z}{(z^2+4)(z-1)^2}$ dz where $C$ is the circle $\|z-1\|=2$ | 7 | MAY2019 |
| 12 | Evaluate $\int_0^{2+i} (\bar{z})^2$ dz along (i) the real axis to 2 and then vertically to $2+i$. ii) the line $2y=x$. | 8 | MAY2019 |

**Module IV**

| | | | |
|---|---|---|---|
| 1 | Define three types of isolated singularities with an example for each | 7 | DEC2016 |
| 2 | Determine the nature and type of singularities of i)$\frac{e^{-z^2}}{z^2}$ ii)$\frac{1}{z}$ | 7 | MARCH 2017 |
| 3 | Use Residue theorem to evaluate $\int_c \frac{30z^2-23z+5}{(2z-1)^2(3z-1)}\,dz$ where c is $\|z\|=1$ | 7 | MARCH 2017 |
| 4 | Evaluate $\int_0^{\infty} \frac{1}{(1+x^2)^2}\,dx$ using residue theorem | 8 | MARCH 2017 |
| 5 | Determine and classify the singular points for the following functions<br>i)$f(z)=\frac{\sin z}{(z-\pi)^2}$ ii) g(z) = $(z+i)^2 e^{\frac{1}{z+i}}$ | 7 | APRIL 2018 |
| 6 | Evaluate $\int_{-\infty}^{\infty} \frac{1}{(1+x^2)^3}\,dx$ | 8 | APRIL 2018 |
| 7 | Evaluate $\int_{-c} \frac{\tan z}{z^2-1}\,dz$ counter clockwise around c :$\|z\|=\frac{3}{2}$ using Cauchy's Residue theorem | 7 | APRIL 2018 |
| 8 | Using contour integration evaluate $\int_{-\infty}^{\infty} \frac{x^2-x+2}{x^4+10x^2+9}\,dx$ | 7 | JULY 2017 |
| 9 | Evaluate $\int logz\,dz$ where $C$ is the circle $\|z\|=1$ | 7 | MAY2019 |
| 10 | Evaluate$\int 1/(5-3sin\theta)d\theta$ | 8 | MAY2019 |
| 11 | Find all singular points and residues of the functions<br>(a)f $(z)$ = $(z-sinz)/z^2$ $(b)$ f(z) =tanz | 8 | MAY2019 |
| 12 | Evaluate $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+1)(x^{2+4})}dx$ | 8 | MAY2019 |

**Module V**

| | | | |
|---|---|---|---|
| 1 | Solve by Gauss elimination method:<br>$X_1 - x_2 + x_3 = 0$<br>$-x_1 + x_2 - x_3 = 0$<br>$10x_2 + 25x_3 = 90$<br>$20x_1 + 10x_2 = 80$ | 5 | MARCH2017 |
| 2 | Find the rank of matrix $\begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & -4 \\ 0 & 4 & 0 \end{bmatrix}$ .Also find a basis for row space and column space | 5 | DEC 2016 |
| 3 | Solve using Gauss elimination method:<br>$y+z-2w = 0$<br>$2x-3y-3z+6w = 2$<br>$4x+y+z-2w = 4$ | 6 | MARCH2017 |
| 4 | Reduce to echelon form and hence find the rank of the matrix $\begin{bmatrix} 3 & 0 & 2 & 2 \\ -6 & 42 & 24 & 54 \\ 21 & -21 & 0 & -15 \end{bmatrix}$ | 6 | MARCH2017 |
| 5 | Find the basis for the null space of $\begin{bmatrix} 2 & -2 & 0 \\ 0 & 4 & 8 \\ 2 & 0 & 4 \end{bmatrix}$ | 8 | MARCH2017 |
| 6 | Are the vectors (3,-1,4) (6,7,5) and (9,6,9) are linearly dependent or independent .Justify your answer. | 5 | MARCH2017 |
| 7 | .Are all vectors (x,y,z) in $R^3$ with y -x+ z =0 form a vector space over the field of real numbers? Justify your answer. | 5 | MARCH2017 |
| 8 | Solve using gauss elimination method:<br>3x+3y+2z=1,x+2y=4,10y+3z=-2,2x-3y-z=5 | 8 | APRIL2018 |
| 9 | Prove that the vectors (1,1,2),(1,2,5),(5,3,4) are linearly dependent | 6 | APRIL2018 |
| 10 | Prove that the set of vectors $V=\{(v_1,v_2,v3) \in \mathbb{R}: -v_1+v_2+4v_3=0\}$ a vector space over the field $\mathbb{R}$. Also find the dimension and the basis | 6 | APRIL2018 |
| 11 | Find the values of $a$ and $b$ for which the system of linear equations $x + 2y + 3z = 6$, $+ 3y + 5z = 9, 2x + 5y + az = b$ has (i) no solution<br>(ii) a unique solution (iii) infinitely many solutions | 7 | MAY2019 |
| 12 | Solve the system of equations by Gauss Elimination Method:<br>$3x + 3y + 2z = 1$, $x + 2y = 4, 10y + 3z = -2$, $2x - 3y - z = 5$ | 8 | MAY2019 |

**Module VI**

| | | | |
|---|---|---|---|
| 1 | Diagonalize the matrix $A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ | 10 | DEC 2016 |
| 2 | If 2 is an eigen value of $\begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ without using its characteristic equation ,find other eigen values .Also find the eigen values of $A^3$ ,$A^T$ ,$A^{-1}$ ,5A, A-3I and Adj A | 7 | JULY2017 |
| 3 | What kind of conic section or pair of straight line is given by the | 6 | DEC 2016 |

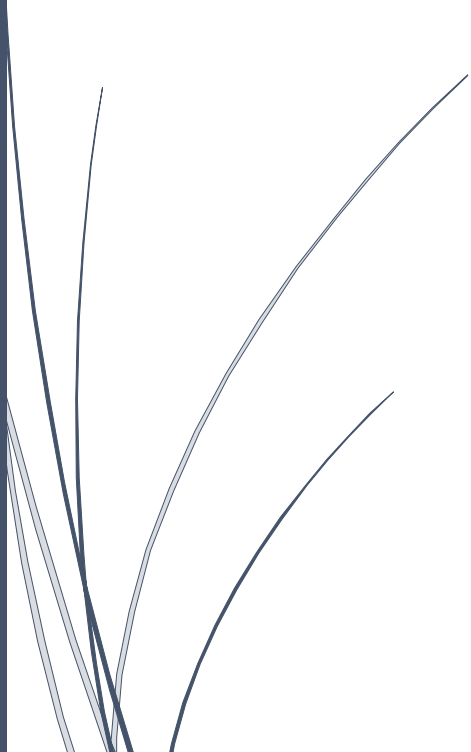
quadratic form
$3x^2+22xy+3y^2=0$ express $(x,y)^T$ in terms of new coordinates.

| | | | |
|---|---|---|---|
| 4 | Find out what type of conic section the quadratic form $Q=17x^2-30xy+17y^2=128$ represents and transform it to the principal axis | 10 | DEC 2016 |
| 5 | Dioganalize the matrix $A=\begin{pmatrix}2&0&1\\0&2&0\\1&0&2\end{pmatrix}$ hence find $A^4$ | 8 | MARCH2017 |
| 6 | Determine whether the matrix is orthogonal $\begin{bmatrix}1&0&-0\\1&1/\sqrt{2}&-1/\sqrt{2}\\0&1/\sqrt{2}&1/\sqrt{2}\end{bmatrix}$ | 5 | DEC 2016 |
| 7 | Find the Eigen values and Eigen vectors of the matrix $\begin{bmatrix}-2&2&-3\\2&1&-6\\-1&-2&0\end{bmatrix}$ | 10 | MARCH2017 |
| 8 | What kind of conic section is given by the quadratic form $7x_1^2+6x_1x_2+7x_2^2=200$.Also find its equation | 6 | APRIL2018 |
| 9 | Find the basis of null space of $A=\begin{bmatrix}2&-2&0\\0&4&8\\2&0&4\end{bmatrix}$ | 6 | MARCH2107 |
| 10 | Reduce to echelon form and hence find the rank of the matrix $A=\begin{bmatrix}3&0&2\\-6&42&24\\21&-21&0\end{bmatrix}$ | 7 | MARCH2107 |
| 11 | Diagonalize the matrix $\begin{bmatrix}3&-1&1\\-1&3&-1\\1&-1&3\end{bmatrix}$ | 12 | APRIL 2018 |
| 12 | Diagonalize the matrix $\begin{bmatrix}-1&2&-2\\2&4&1\\2&1&4\end{bmatrix}$ | 8 | MODEL QUESTION |

2018 Batch S3
2018-22

# HS 200 BUSINESS ECONOMICS

***Faculty – Dr. Rajasekharan Pillai***



| | | |
|---|---|---|
| | **QUESTION BANK** | |
| | **BUSINESS ECONOMICS** | |
| | | |
| | **Module 1** | |
| | | |
| 1 | a. What are basic or central economic problems?<br><br>b. How will you use PPC to explain opportunity cost? | (5)<br>(5) |
| 2 | Explain the Marginal utility theory with the help of a figure? | (10) |
| 3 | What is meant by economic problem? What are the causes of emergence of an economic problem? | (10) |
| 4 | What is diminishing marginal utility ? Explain the law with the help of an empirical example. | (10) |
| 5 | Explain<br>1 Marginal utility<br>2 Total utility<br>3 Micro economics<br>4 Utility<br>5 Opportunity cost | (10) |
| 6 | A country producing wheat and cloth in a neutral proportion, a sudden change in the technology will lead high production in both of the product. Explain with the help of PPC ? | (10) |
| 7 | a. Examine the meaning and scope of Business Economics?<br><br>b. Explain the factors affecting Utility? | (6)<br>(4) |
| 8 | a. Explain the shift in PPC with the help of figure?<br><br>b. What are the difference between marginal utility and total utility? | (6)<br>(4) |
| 9 | a. What is business economics?<br><br>b. How does a business economics helps a manager in decision making? | (5)<br>(5) |
| 1 | a. Define a production possibility curve? Mark full employment and Under utilization of resources in a PPC.<br><br>b. Cigarette may be harmful but it may posses utility. Do you agree? Give reasons . | (5)<br>(5) |

| | **Module 2** | |
|---|---|---|
| 1 | Explain<br>1. Demand<br>2. Joint demand<br>3. Veblan good<br>4. Opportunity cost<br>5. Supply | (10) |
| 2 | a. Degrees of price elasticity?<br><br>b. Explain change in demand?<br><br>1. Expansion and contraction<br>2. Increase and decrease in demand | (6)<br>(4) |
| 3 | a. Law of variable proportion with the help of a figure?<br><br>b. What is production? Explain the factors of production? | (6)<br>(4) |
| 4 | a. Cobb- Dugless production function?<br><br>Suppose the production function is given as Q=2K½L½<br>1. What will be output when K=16 & L=36?<br>2. what is marginal product of labour?<br><br>b . Draw a total cost curve with the help of Tvc & Tfc? | (6)<br><br>(4) |
| 5 | a. How is the equilibrium price of a commodity determined? Suppose the number<br>Of buyers of a commodity increases. How does it affects market demand curve And equilibrium price? Draw a diagram and explain.<br><br>b. Suppose the finance minister increase the tax on those commodities Where demand is highly elastic. What happens to total tax revenue? Why? | (6)<br><br>(4) |
| 6 | a. What is a production function? Distinguish between<br>Fixed proportion and variable proportion.<br><br>b. Suppose the production function is given as Q=3L½K½. Find average and marginal product of labour when L=9 and K=4. | (5)<br><br>(5) |
| 7 | Show the law of variable proportion with help of a figure? | (10) |
| 8 | a. Determining the factors affecting demand?<br><br>b. Point out the factors affecting supply? | (7)<br>(3) |

<table>
<tr><td>9</td><td>a. What are the different types of demand?<br><br>b. Explain the Cobb-Duglas produo=ction function and bring out its merits and demerits?</td><td>(6)<br>(4)</td></tr>
<tr><td>10</td><td>Explain the different types of elasticity?</td><td>(10)</td></tr>
<tr><td colspan="2">Module 3</td><td></td></tr>
<tr><td>1</td><td>a. Find out a break even point in a break even analysis with the help is figure ?<br><br>b. Suppose the monthly fixed cost of a firm Rs 20000/-, Variable cost 30000/-, sales 60000/-<br>Find out BEP ?( Break Even Point )</td><td>(5)<br><br>(5)</td></tr>
<tr><td>2</td><td>Explain perfect competition with the price determination?</td><td>(10)</td></tr>
<tr><td>3</td><td>a. what are the basic difference between Monopoly And Monopolistic competition ?<br><br>b. What is the marginal importance of BEP</td><td>(4)<br><br>(6)</td></tr>
<tr><td>4</td><td>Explain<br>1 Real cost<br>2 Social cost<br>3 Replacement cost<br>4 short run cost<br>5 Fixed cost<br>6 opportunity cost</td><td>(10)</td></tr>
<tr><td>5</td><td>a. Complete the following short run cost schedule?<br><br><table><tr><td>Output</td><td>TC</td><td>TFC</td><td>TVC</td><td>MC</td></tr><tr><td>0</td><td>100</td><td>--------</td><td>-------</td><td></td></tr><tr><td>1</td><td>---------</td><td>--------</td><td>50</td><td>-------</td></tr><tr><td>2</td><td>---------</td><td>--------</td><td>-------</td><td>40</td></tr></table>.<br>b. What are the difficulties of measurement now national income?</td><td>(6)<br><br>(4)</td></tr>
<tr><td>6</td><td>a. What is a short run shutdown point?<br><br>b. Suppose price of a product is less than AC. Will a firm stop Production or continue? Why?</td><td>(3)<br><br>(7)</td></tr>
</table>

| | | |
|---|---|---|
| 7 | a. State the main features of monopoly market?<br><br>b. Demand curve facing a firm under perfect competition is perfectly elastic. Why? | (6)<br><br>(4) |
| 8 | Explain<br>1. Marginal revenue<br>2. Margin of safety<br>3. Variable cost<br>4. Total revenue | (10) |
| 9 | a. What is meant by stock and flow?<br><br>b. Explain break even analysis with diagram? | (5)<br>(5) |
| 10 | Pricing under oligopoly market requires some assumptions about the behavior of rival firms. Several models have been put forward for this purpose. Discuss the two prominent models explaining the behavior of rival firms in an oligopoly market? | (10) |
| | **Module- 4** | |
| 1 | a. What is repo rate? How does RBI use it as a measure to control inflation?<br><br>b. National income of a country is given as 2850. If the annual depreciation Is 300, net factor income from abroad is 50, and net indirect tax is 100, Estimate GDPmp? | (4)<br><br>(6) |
| 2 | Explain<br>1 Intermediate goods<br>2 Gross Domestic product<br>3 Net National Product<br>4 private income.<br>5 personal disposable income. | (10) |
| 3 | a. What are the difference between product method and income method of national income measurement | (6) |
| | b. Explain final expenditure method | (4) |
| 4 | a. Fisher equation?<br><br>b. Types of inflation?<br><br>c. What is demand pull inflation & explain the causes? | (3)<br>(3)<br>(4) |

| | | |
|---|---|---|
| 5 | What are the main measures to control inflation? | (10) |
| 6 | a. Trade cycle?<br><br>b. How would you define money? | (6)<br>(4) |
| 7 | What is deflation and Explain the causes of deflation? | (10) |
| 8 | a. State the Cambridge version of quantity theory of money?<br><br>b. Major causes of inflation in a country? | (7)<br>(3) |
| 9 | How is national income estimated? Bring out the difficulties involved in | |
| 10 | National income estimation in under developed countries? | (10) |
| 11 | What is the risk join with Bitcoins? State your points. | (10) |
| | | |
| | **Module 5** | |
| | | |
| 1 | a. What are the main process of capital budgeting? | (5) |
| | b. Explain the types of investment projects? | (5) |
| 2 | a. Initial investment Rs - 2500/-, cost of capital- 10% find out NPV on the Following cash flows given below? | (10) |
| 3 | <table><tr><td>Year</td><td>Cash</td></tr><tr><td>1</td><td>900</td></tr><tr><td>2</td><td>800</td></tr><tr><td>3</td><td>700</td></tr><tr><td>4</td><td>600</td></tr><tr><td>5</td><td>500</td></tr></table>a . Limitations of NPV mathod? | (3) |
| | b. Merits of IRR method?<br><br>c. What is pay back method? Write down two merits and demerits Of payback method? | (3)<br><br>(4) |
| 4 | a. What are the basic sources of Risk ? | (6) |
| 5 | b. What do you mean by decision taking under uncertainty?<br>Explain the types of forecasting? ( minimum 5 types ) | (4)<br>(10) |
| 6 | a . what is cost benefit analysis? Point out the limitations? | (5) |
| | b. What is IRR and its limitations? | (5) |

<table>
<tr><td>7</td><td>a. Suppose the initial investment in a project is estimated as 25000<br>and the cost of capital is 10%. Estimate the NPV of the future cash flows<br>after tax given below and state weather the project will be accepted or not.<br><br><table><tr><td>Year</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>Cash flow</td><td>9000</td><td>8000</td><td>7000</td><td>6000</td><td>5000</td></tr></table><br>b. What do you mean by a risky situation in business,<br>How is decision taken under risk?</td><td>(6)<br><br><br><br><br>(4)</td></tr>
<tr><td>8</td><td>a. From the following data choose the best project based on payback period?<br>Capital cost - Project A =15000, Project -B=15000<br><table><tr><td>Cash flow</td><td>Project A</td><td>Project B</td></tr><tr><td>1</td><td>5000</td><td>4000</td></tr><tr><td>2</td><td>5000</td><td>4000</td></tr><tr><td>3</td><td>5000</td><td>4000</td></tr><tr><td>4</td><td>2000</td><td>3000</td></tr><tr><td>5</td><td>1500</td><td>2000</td></tr><tr><td>6</td><td>1500</td><td>8000</td></tr></table>b. What are the limitations of payback method?</td><td>(6)<br><br><br><br><br><br><br><br>(4)</td></tr>
<tr><td>9</td><td>a. Draw a decision tree?<br><br>b. What is meant by capital budgeting?</td><td>(5)<br>(5)</td></tr>
<tr><td>10</td><td>How does sensitivity analysis help a decision maker to choose a project ?<br>What are the limitations?</td><td>(10)</td></tr>
<tr><td></td><td>Module 6</td><td></td></tr>
<tr><td>1</td><td>a. Classify the following items under Asset and Liability sides?<br><br>Petty cash, Accrued interest, copy right, Sundry debtor, Bills receivable,<br>Dividends payable, Inventory, patent, Wages, Pension</td><td>(6)</td></tr>
<tr><td>2</td><td>a.Explain causative model?<br><br>b. GST?</td><td>(6)<br>(4)</td></tr>
<tr><td>3</td><td>a.Write for limitations of a balance sheet?<br>b. What is a balance sheet?</td><td>(6)<br>(4)</td></tr>
</table>

| | | |
|---|---|---|
| 4 | Explain<br><br>1.Liquidity ratio<br>2.Current ratio<br>3.working capital<br>4.Quick ratio<br>5.Leverage ratio | (10) |
| 5 | a. What are the features of forecasting?<br><br>b. What is Delphi method?<br><br>c. What is Naive method? | (4)<br>(3)<br>(3) |
| 6 | What are the difference between money market and capital market? | (10) |
| 7 | a. International financing?<br><br>b. Foreign Directi Investment FDI<br><br>c. Foreign portfolio Investment FPI<br><br>d. Foreign Institutional investment FII | (1)<br>(3)<br>(3)<br>(3) |
| 8 | a. What are the basic difference between FDI&FPI?<br><br>b. Point out three advantages and disadvantages of foreign Direct investment FDI | (5)<br><br>(5) |
| 9 | a. The principles of Taxation?<br><br>b. Point out the difference between direct and indirect taxes? | (5)<br>(5) |
| 10 | Explain the main sources of capital? | (10) |