Seat No. : _____

DB-104

December-2013

B.Sc. (Sem.-V) (CBCS)

Phy-304 : Physics

Time : 3 Hours] [Max. Marks : 70

સૂચના : (1) સંજ્ઞાઓ તેમનાં પ્રચલિત અર્થ ધરાવે છે.
Instructions : Symbols have their usual meaning.
(2) જ.બા. દર્શાવેલ અંક પ્રશ્નનાં ગુણ દર્શાવે છે.
Figures on R.H.S. shows marks of question.

1 (a) સામાન્ય એમ્પ્લિફાયર માટે પ્રવાહ ગેઇન, વોલ્ટેજ ગેઇન અને પાવર ગેઇન વ્યાખ્યાયિત કરો. 6
Define current gain, voltage gain and power gain for general amplifier.

અથવા/OR

નીચે મુજબ તારવો :

$$dB = 20 \log\left(\frac{V_o}{V_i}\right) + 10 \log\left(\frac{R_i}{R_o}\right)$$

Derive :

$$dB = 20 \log\left(\frac{V_o}{V_i}\right) + 10 \log\left(\frac{R_i}{R_o}\right)$$

(b) જરૂરી ડાયાગ્રામ સાથે એમ્પ્લિફાયર નોટેશન્સ વર્ણવો. 5
Describe amplifier's notations along with necessary diagram.

અથવા/OR

વોલ્ટમીટરનો ડેસીબલ ઈન્ડીકેટર તરીકે ઉપયોગ વર્ણવો.
Describe use of a voltmeter as a decibel indicator.

(c) એક એમ્પ્લિફાયરના સિગ્નલ ઈનપુટ વોલ્ટેજ $V_i = 0.2$ Volt છે. અને તે ઉદ્ગમમાંથી 2 mA પ્રવાહ ખેંચે છે. એમ્પ્લિફાયર 15 mA પ્રવાહ સાથે ઉદ્ભારને 9 Volt આપે છે. પ્રવાહ ગેઇન તથા વોલ્ટેજ ગેઇન મેળવો. 3
An amplifier has a signal input voltage $V_i = 0.2$ Volt and draws 2 mA from the source. The amplifier delivers 9 volt to a load at 15 mA. Determine the current gain and voltage gain.

અથવા/OR

જો પરિપથના ઈનપુટ 10 Volt અને આઉટપુટ 5 Volt હોય અને ઈનપુટ તથા આઉટપુટ અવબાધો સમાન હોય તો પરિપથ પરના dB ગેઇનની જાણકારી કરો.
If the input to a network was 10 Volt and the output 5 Volt, and the input and output impedances were equal, determine the dB gain across the network.

2. (a) સ્કવેર વેવ માટેનો એમ્પ્લિફાયર નિમ્ન આવૃત્તિ રીસ્પોન્સ વર્ણવો. 8
Describe amplifier low frequency response to a square wave.

અથવા/OR

CE એમ્પ્લિફાયર માટે ઉચ્ચ આવૃત્તિ મૉડેલમા હાઈબ્રીડ-π કેપેસીટન્સ, બેઈઝ સ્પ્રેડીંગ રેઝીસ્ટન્સ અને ટ્રાન્ઝિસ્ટર ટ્રાન્સકન્ડક્ટન્સની સમજૂતી આપો.
Explain the hybrid-π capacitances, base spreading resistance and transistor transconductance in high frequency model for the CE amplifier.

(b) નિમ્ન આવૃત્તિ રીસ્પોન્સ ઉપર કપલીંગ કેપેસીટરની અસર વર્ણવો. 6
Describe effect of coupling capacitor on low-frequency response.

અથવા/OR

CE શોર્ટ પરિપથ-પ્રવાહ ગેઈન સમજાવો.
Explain CE short circuit current gain.

3. (a) નીચેની ઈનપુટ શરતો માટે ઉચ્ચ આઉટપુટ મળે છે : 7
0110, 1100, 1101, 1111, 1110, 1000, 1001, 1011 અને 1010.
કર્નોમેપ વડે સરળ SOP અને POS ડીજીટલ લોજીક પરિપથો ડિઝાઈન કરો.
Suppose output is high for input conditions :
0110, 1100, 1101, 1111, 1110, 1000, 1001, 1011 and 1010.
Using karnaugh maps, design SOP and POS digital logic circuits.

અથવા/OR

Ex-OR ગેઈટની વિસ્તૃત સમજૂતી આપો અને 3-ઈનપુટ અને 4-ઈનપુટ Ex-OR ગેઈટના માત્ર પરિપથ ડાયાગ્રામ દોરો.
Explain EX-OR gate in detail. And draw only circuit diagrams of 3-input and 4-input EX-OR gate.

(b) Clocked R-S ફ્લીપ-ફ્લોપ ઉપર નોંધ લખો. 7
Write a note on Clocked R-S flip-flop.

અથવા/OR

Clocked D ફ્લીપ-ફ્લોપ ઉપર નોંધ લખો.
Write a note on Clocked D flip-flop.

4. (a) T અને π સેક્શનના પારસ્પરિક રૂપાંતરણો તારવો. 7
Derive the mutual conversion between T and π sections.

અથવા/OR

થેવેનીન પ્રમેયનું કથન લખી સાબિતી આપો.
State and prove Thevenin's theorem.

(b) શ્રેણી અનુનાદ પરિપથ સમજાવો, તે માટે અનુનાદ આવૃત્તિનું સમીકરણ તારવો. સાબિત કરો કે E_L અને E_C વોલ્ટેજ સમાન મૂલ્યના અને પરસ્પર વિરુદ્ધ સંજ્ઞામાં મળે છે. 7
Explain series resonance circuit, derive equation for series resonance circuit. Prove that the voltages E_L and E_C are equal in magnitude and opposite in sign for this circuit.

અથવા/OR

સમાંતર અનુનાદ પરિપથમાં પ્રવાહોની ચર્ચા કરો. અને $\frac{I_C}{I_L} = \sqrt{1 - \frac{1}{Q^2}}$ સાબિત કરો.

Discuss currents in antiresonance circuit and derive. $\frac{I_C}{I_L} = \sqrt{1 - \frac{1}{Q^2}}$

5. નીચેના પ્રશ્નોનાં ટૂંકમાં જવાબ આપો : 14

Answer in short :

(1) એમ્પ્લિફાયર ઈનપુટ અવરોધ R_i વ્યાખ્યાયિત કરો.
Define amplifier input resistnace R_i. $R_i = \frac{V_i}{I_s}$

(2) કન્વર્ઝન એફીસીયન્સી (રૂપાંતરણ કાર્યક્ષમતા)ની વ્યાખ્યા આપો.
Define Conversion Efficiency. $\eta = \frac{P_o}{P_{dc}}$

(3) ડેસીબેલ્સની વ્યાખ્યા આપો.
Define Decibels. $\text{No. of decibels} = 10 \log_{10} \frac{P_2}{P_1}$

(4) મધ્ય આવૃત્તિ ગેઈનથી કેટલા dB પાવર ગેઈન નિમ્ન આવૃત્તિએ નીચે ઉતરે છે અથવા ડ્રોપ થાય છે ?
The power gain at low frequency dropped by how much dB from the gain at the mid frequency. 3dB

(5) ગુણોત્તર $\left|\frac{A_{v(LF)}}{A_{v(MF)}}\right|$ નું મૂલ્ય કેટલું મળે છે ?
What is the value of the ratio $\left|\frac{A_{v(LF)}}{A_{v(MF)}}\right|$? $\frac{1}{\sqrt{2}}$

(6) ટ્રાન્ઝિસ્ટરના ટ્રાન્સકન્ડક્ટન્સ, g_m ની વ્યાખ્યા આપો.
Define transconductance g_m of transistor.

(7) "Quad" એટલે શું ?
What is "Quad" ?

(8) "Don't Care Condition" સમજાવો.
Explain "Don't care condition".

(9) "Flip-Flop" ટૂંકમાં સમજાવો.
Explain "Flip-Flop" in brief.

(10) "Active Network" ની વ્યાખ્યા આપો.
Define "Active Network".

(11) Compensation પ્રમેયનું કથન લખો.
Write statement of compensation theorem.

(12) "Q" વ્યાખ્યાયિત કરો.
Define Q.

(13) શ્રેણી અનુનાદ એટલે શું ?
What is series resonance ?

(14) 'Bandwidth' ટૂંકમાં સમજાવો.
Explain "Bandwidth" in brief.

Seat No. : _____

N16-109

November-2014

B.Sc., Sem.-V (CBCS)

PHY-304 : Physics

Time : 3 Hours] [Max. Marks : 70

Instructions : (1) Symbols have their usual meaning.
(2) Figures on R.H.S. show marks of question.

1. (a) Explain five-point method of calculating harmonic distortion. 8

OR

Explain three-point method of calculating harmonic distortion.

(b) Explain voltmeter range correction factors. 6

OR

Explain zero decibel reference level.

2. (a) Describe effect of coupling capacitor on low frequency response. 7

OR

Explain : Approximate CE high frequency model with resistive load.

(b) Describe amplifier low frequency response to a square wave and explain 'sag'. 7

OR

Describe amplifier high frequency response to a square wave.

3. (a) Suppose the output for the input conditions 0000 to 0011 is high, 0100 to 1001 is low, and 1010 to 1111 is high. Design SOP and POS logic circuits using Karnaugh-Map simplification method.

OR

Explain in detail R-S flip-flop. 7

(b) Explain two-input EX-OR gate. Draw only circuit diagram of three-input and four-input EX-OR gate. 7

OR

Write a note on JK Master slave flip-flop.

4. (a) Explain transformation of given π-network to its equivalent T-network. Derive necessary formulae. 7

OR

Describe parallel resonance circuit. And derive equation for anti-resonant frequency.

(b) State and prove Thevenin's Theorem. 7

OR

Derive equation showing relation between X_L and X_C using equation of anti-resonance frequency for parallel resonance circuit.

Derive $R_{ar} = \frac{L}{CR}$

For anti-resonance circuit, if resistance R = 1 kΩ, inductance L = 30 mH and capacity C = 7.5 μF then obtain R_{ar}.

5. Answer in short : 14

(1) Define voltage gain.

(2) Define power gain.

(3) Define conversion efficiency.

(4) What is harmonic distortion ?

(5) Where the 'Bypass' capacitor is connected in CE circuit ?

(6) Where the 'Coupling' capacitor is connected in CE circuit ?

(7) How the 'Cascading' of CE stages is done ?

(8) What is 'Pair' in Karnaugh Map ?

(9) What is 'Octet' in Karnaugh Map ?

(10) Name the circuit used as 1-bit storage device.

(11) Write a statement of superposition theorem.

(12) Write the statement of Norton's theorem.

(13) When the parallel resonance takes place ?

(14) Define Q-factor.

Patel Bhavin R

Seat No. : _____

NE-101

December-2015

B.Sc., Sem.-V

Core Course-304 : Physics

Time : 3 Hours] **[Max. Marks : 70**

1. Answer any **two** : 14

(1) Define current gain, voltage gain, and power gain; explain the method of measuring input resistance and output resistance of Amplifier.

(2) What is harmonic distortion ? Explain three point method of calculating harmonic distortion for Amplifier.

(3) Define Bel and Decibel. Explain zero decibel reference level in detail.

(4) Explain how voltmeter can be used as a decibel indicator.

2. Answer any **two** : 14

(1) Explain the effect of emitter bypass capacitor on low-frequency response of CE Amplifier.

(2) Discuss the low frequency response of an amplifier for square wave.

(3) What is the Miller effect ? Explain how it influences the high frequency response of the transistor amplifier.

(4) Explain the high frequency response of a transformer coupled amplifier.

3. Answer any **two**: 14

(1) Explain about Sum of Product method and design truth table and draw AND-OR circuit for logic expression $Y = \bar{A}BC + A\bar{B}C + AB\bar{C} + ABC$.

(2) Explain the method for simplification of logic expression with help of 4-variable Karnough map.

(3) Explain the working of D-flip-flop and mention its uses.

(4) Explain the working and uses of Master-Slave JK-flip-flop.

4. Answer any two :

(1) Explain the method to convert a π-network into equivalent T-network and vice-versa.

(2) State and prove Thevenin's theorem.

(3) For a series resonant circuit derive the equation for resonance frequency and show that at resonance, the voltage across capacitor and inductor are equal and opposite.

(4) For parallel resonance circuit derive the equation for resonance frequency and relation between capacitive and inductive reactance.

5. Answer following in brief :

(1) Define current gain.

(2) Write classes of amplifiers operation.

(3) Define Sag.

(4) Define Band width.

(5) Write definition of conversion efficiency.

(6) Write the methods to cascade CE amplifier.

(7) What is flip-flop ?

(8) Define propagation delay.

(9) Define clock pulse.

(10) What is quad in a Karnough map ?

(11) Define Mesh.

(12) What is bilateral network ?

(13) Define Driving point impedance.

(14) Define Transfer impedance.

Diyar Dudhat

Seat No. : _____

ME-112

November-2016

B.Sc., Sem.-V

CC-304 : Physics

Time : 3 Hours] [Max. Marks : 70

Instructions : (1) Symbols have their usual meaning.

(2) Figure on R.H.S. shows marks of question.

(3) All questions carry equal marks.

1. (a) Describe amplifier notations along with necessary diagram. 103 6

OR

Obtain dB gain equation, $dB = 20 \log\left(\frac{V_o}{V_i}\right) + 10 \log\left(\frac{R_i}{R_o}\right)$. 121

(b) Explain impedance correction factor. 124 5

OR

What is decibel ? Discuss zero decibel reference level and its application in various fields. 120, 122, 123

(c) A single stage amplifier employing one active device is powered by a 9 volt battery, which has a current drain of 20 mA. If the load voltage is 3 volt at 12 mA, determine the conversion efficiency of the active device. 3

OR

If an amplifier has its output power increased from 4 watts to 8 watts, corresponding how much increase in dB takes place ?

2. (a) Explain low frequency response of amplifier to a square wave. 256 7

OR

Discuss transformer coupled transistor amplifier at low frequency and derive equation for current gain. 258

(b) Describe amplifier high frequency response to a square wave. 274 7

OR

With necessary circuit discuss CE short-circuit current gain hence discuss β cut off frequency and α cut off frequency. 268

3. (a) (i) Simplify the Boolean equation

$Y = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + A\bar{B}\bar{C} + AB\bar{C}$ 5

(ii) Draw a circuit diagram of two input EX-OR gate. 2

OR

Suppose output is high for the input conditions :

0110, 1100, 1101, 1111, 1110, 1000, 1001, 1011 and 1010.

Draw corresponding truth table and Karnaugh Map. Using Karnaugh map simplification, Design SOP and POS circuits.

(b) Describe R-S flip-flop in detail. 7

OR

Write a note on clocked D flip-flop.

4. (a) Explain in detail the lattice network. 7

OR

State and prove the superposition theorem.

(b) Explain the 'Bandwidth' of Parallel resonance circuit. 7

OR

Explain series resonance circuit. Obtain expression for resonant frequency f_r. Prove that the voltages across inductor and capacitor are equal in magnitude but opposite in sign at the time series resonance.

5. Answer in short : 14

(1) What is called frequency distortion ?

(2) What is called amplifier ?

(3) Define conversion efficiency.

(4) Write expression for number of bels.

(5) Write expression of 'sag'.

(6) Write expression of trans-conductance.

(7) What is cascading of amplifiers?

(8) Define 'Quad' in Karnaugh map.

(9) Define 'Octet' in Karnaugh Map.

(10) What is 'don't care' condition ?

(11) Define figure of merit Q.

(12) What is parallel resonance ?

(13) Write statement of "Reciprocity Theorem".

(14) Write statement of "Maximum Power Transfer" theorem.

Seat No. : 04241

NN-105

November-2017

B.Sc., Sem.-V

CC-304 : Physics

Time : 3 Hours] **[Max. Marks : 70**

Instructions : (1) **All** questions are compulsory.
(2) The symbols have their usual meaning.
(3) Figures in the RHS show marks.

1. (a) What is harmonic distortion ? Explain three point method of calculating harmonic distortion. Obtain amplitude A_0, A_1, A_2. 7

OR

What would be the input resistance of an ideal amplifier ? Explain it with necessary formula and circuit. Describe one method to measure the input resistance of an amplifier.

(b) What is decibel ? Explain zero decibel reference level. Give characteristics of decibel. Derive $dB = 20 \log \left(\frac{V_O}{V_i}\right) + 10 \log \left(\frac{R_i}{R_O}\right)$. 7

OR

(i) Describe use of a voltmeter as a decibel indicator.
(ii) If the input to a network was 5 V and the output 2.5 V, and the input and output impedances were equal, determine the dB gain across the network.

2. (a) Explain the effect of emitter bypass capacitor on low frequency response of CE amplifier. 7

OR

Draw neat circuit diagram of three cascaded stages of CE amplifier and derive the equation for voltage gain.

(b) Explain transformer coupled transistor amplifier. Show that mid frequency stage gain A_i and A_v are equal. 7

OR

Explain with necessary circuit and formula the approximate high frequency model for CE short circuit current gain.

3. (a) Explain in detail RS flip-flop. 7

OR

Write a note on clocked D flip flop.

(b) (i) Simplify the Boolean equation using Boolean laws and theorem. 7

$Y = (A + B)(A + \bar{B})(\bar{A} + B)$

(ii) Explain "Don't care condition" in digital system.

OR

Derived simplified Boolean equation using Karnaugh map for the logic equation expressed in mini terms $Y = \Sigma m(7, 9, 10, 11, 12, 13, 14, 15)$

Draw the corresponding SOP logic circuit.

(i) Using basic logic gates (OR and AND)

(ii) Using only NAND gate

4. (a) Derive mutual conversion equation between T and π section. 7

OR

State and prove Thevenin's theorem.

(b) Explain series resonance circuit. Derive equation for resonance frequency. Prove that Voltage E_L and E_C are equal in magnitude and opposite in sign for the circuit. 7

OR

Describe parallel resonance circuit in detail. Derive equation of f_{ar} (resonance frequency) and obtain $R_{ar} = \frac{L}{CR}$.

5. Answer in short. 14

(1) What is meant by notation $I_{1/2}$ and $I_{-1/2}$?

(2) What would be the output resistance of an ideal amplifier ?

(3) Under what conditions is the power gain in decibel equal to $20 \log V_o/V_i$.

(4) Define conversion efficiency.

(5) Write an equation of over all value of low frequency $f_l(n)$ for identical cascade stage each having same value of low frequency f_l.

(6) Why is it that the total voltage gain of a cascaded amplifier is the product of the stage gain, but the total current gain is not the product of all the stage current gain ?

(7) What is the principal advantage of using transformer to cascade transistor amplifier stages ?

(8) In the cascaded amplifier is the band width of the overall amplifier wider or narrower than that of one of the stage.

(9) How many fundamental products are there for two variables ? How many for three and four variables ?

(10) How many entries are there on a four variables Karnaugh map ?

(11) Name the circuit used as 1 bit memory storage device.

(12) Write a statement of superposition theorem.

(13) What is bilateral network ?

(14) Define Q factor.