SV - 445

Total No. of Pages : 2

| Seat No. | |
|---|---|

# S.E. (Electronics and Telecommunication) (Semester - IV) Examination, May - 2018

## ANALOG CIRCUITS - II

### Sub. Code : 63466

**Day and Date : Friday, 04 - 05 - 2018** **Total Marks : 100**

**Time : 10.00 a.m. to 01.00 p.m.**

**Instructions :** 1) **All questions are compulsory.**
2) **Assume suitable dada if required.**
3) **Figure to right indicates full marks.**

*Q1)* Attempt any three questions. **[18]**

a) Derive the parameter equations such as Ri. Ro, Av and Ai for multistage RC coupled amplifier.

b) Explain operation of class AB push pull amplifier?

c) What is harmonic distortion? Explain three-point method of calculating harmonic distortion of power amplifier.

d) What is feedback? With the help of expressions explain advantages of negative feedback.

*Q2)* Attempt any two questions. **[16]**

a) Design a two stage direct coupled amplifier for $R_L$ = 5 kΩ, $V_{cc}$ = 10 V, $R_s$ = 200Ω and frequency of operation = 7 Hz. Provide per stage gain greater than 11.

b) Design class AB push pull amplifier for following specifications
$P_o$ = 600 mW, Loud speaker impedance = 6Ω, Vcc = 15V.

c) Design current series negative amplifier for following specifications, $V_{cc}$ = 12 V, Av = 25, S = 9.

*Q3)* Attempt any two questions. **[16]**

a) Design a two stage amplifier with per stage gain greater than 70 and lower 3dB frequency not more than 10 Hz. The output should be of 8V(p-p) ,Consider $R_s$ = 300Ω. $V_{cc}$ = 12 V, S = 9.

b) Design complimentary symmetry power amplifier to deliver a power of 2.2w to a load of 8Ω. The lower 3dB cut-off frequency is 60 Hz.

c) Derive the expression for Rif, Rof, Avf and Aif for current series negative feedback.

Q4) Attempt any two. [16]

a) Design Hartely's oscillator for following data.
F=10KHz $V_{o(p-p)}$ = 10 V Vcc =20 V $P_{D\,(max)}$ = 1W
$V_{CE}$ = 45V $V_{Ic\,(max)}$ = 1 A $h_{fe}$ = 200 $h_{ie}$ = 4.5 k.

b) Derive the expression for frequency of oscillation for Wein bridge oscillator.

c) Design Wein bridge oscillator for following data F = 10KHz $V_{o\,(p-p)}$ = 10 V Vcc = 20 V $P_{D\,(max)}$ = 1 W $V_{CE}$ = 45 $V_{Ic\,(max)}$ = 1 A $h_{fe}$ = 200 $h_{ie}$ = 4.5 k.

*Q5)* Attempt any two. [16]

a) Derive expression for the time duration of astable multivibrator.

b) Design the Schmitt trigger by using transistor. Assume following data : UTP = 2 V LTP = 1 V Vcc = 10 V $I_{csat}$ = 5 mA $V_{BEsat}$ = 0.7 V
$h_{fe}$ = $V_{CEsat}$ = 0.25 V

c) Design fixed bias bistable multivibrator. Using following $h_{fe}$ = 100, ICsat = 10 mA, = $V_{BEsat}$ = 0.7 V, $V_{CEsat}$ = 0.3 V, Vcc = 12 V, $V_{BB}$ = -3V, OF = 2.

*Q6)* Write a short note any three. [18]

a) RC Phase shift oscillator

b) Monostable multivibrator

c) IC 723

d) LM 317 (Voltage Regulator)

ⓘⓘⓘ

SV - 446

| Seat No. | |
|---|---|

Total No. of Pages : 2

# S.E. (ETC) (Part - II) (Semester - IV) Examination, May - 2018
## LINEAR INTEGRATED CIRCUITS (Revised)
## Sub. Code : 63467

**Day and Date : Monday, 07 - 05 - 2018** **Total Marks : 100**

**Time : 10.00 a.m. to 01.00 p.m.**

**Instructions :** 1) **All questions are compulsory.**
2) **Figures to right indicate full marks.**

## SECTION - I

*Q1)* Attempt any two. **[2 × 8 = 16]**

a) Draw and explain dual input, balanced output differential amplifier with DC analysis.

b) Explain ideal characteristics of op-amp.

c) Explain two circuits used for level shifting.

*Q2)* Attempt any two. **[2 × 8 = 16]**

a) Derive Equation for gain, input resistance output resistance for closed loop inverting amplifier.

b) Draw and explain closed loop differential amplifier using two op-amps.

c) Discuss the frequency response for compensated and uncompensated op-amp.

*Q3)* Attempt any two. **[2 × 9 = 18]**

a) Draw the circuit of V - I converter if the load is

i) Floating

ii) Grounded

b) Draw and explain positive and negative peak detector using op-amp with waveforms.

c) Draw and explain full wave rectifier circuit using op-amp with waveforms.



*P.T.O.*

## SECTION - II

*Q4)* Attempt any two. **[2 × 8 = 16]**

a) Draw and explain working principle of all pass filter and derive expression for gain and phase shift between input and output.

b) Draw and explain Narrow Band-Reject filter & design it for $f_N = 60$ Hz.

c) Design a second order HPF for cut off frequency of 1KHz. Draw a circuit diagram.

*Q5)* Attempt any two. **[2 × 8 = 16]**

a) Draw neat circuit diagram of RC phase shift oscillator and derive equation for frequency of oscillations.

b) Draw and explain square wave generator using op-amp and derive equation for frequency of oscillations.

c) Draw and explain the circuit diagram of Monostable multivibrator using op-amp and derive expression for pulse width.

*Q6)* Attempt any two. **[2 × 9 = 18]**

a) Define the terms

i) lock range

ii) capture range and

iii) pull in time

b) Draw and explain the circuit diagram of Astable multivibrator using IC 555 and design Astable multivibrator using IC 555 with frequency 2kHz and duty cycle of 75%.

c) Draw and explain the circuit diagram of Monostable multivibrator using IC 555 amd derive expression for pulse width.

▽▽▽▽

SV - 448

Total No. of Pages : 2

| Seat No. | |
|---|---|

# S.E. (Electronics & Telecommunication) (Part - II)
## (Semester - IV) Examination, May - 2018
## ELECTROMAGNETIC ENGINEERING
## Sub. Code : 63469

**Day and Date : Monday, 14 - 05 - 2018** **Total Marks : 100**

**Time : 10.00 a.m. to 01.00 p.m.**

**Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Assume suitable data if necessary.**

*Q1)* Solve any two : **[16]**

a) Point charge of 120 nc are located at A(0, 0, 1) and B(0, 0, –1) in free space

i) Find E at (0.5, 0, 0)

ii) What single charge at the origin would provide the identical field strength.

b) Transform cartesian coordinate system to spherical coordinate system.

c) Given two charge distributions in free space : 0.2nc/m on the line $z = 1$, $y = 3$ and a point charge of 0.5nc at the origin. Find $\bar{E}$ at point (2, 3, 4).

*Q2)* Solve any two : **[16]**

a) State and prove electric field intensity due to infinite sheet charge.

b) A point charge 25nc is located in free space at p(2, –3, 5) and a perfectly conducting plane is at $Z = 2$ find.

i) V at (3, 2, 4)

ii) $\bar{E}$ at (3, 2, 4)

iii) $\rho_s$ at (3, 2, 2)

c) If $V = x - y + xy + z$ (volts) find $\bar{E}$ at (1, 2, 4) and the electrostatic energy stored in a cube of side 2m centered at origin.

*P.T.O.*

*Q3)* Solve any three : [18]

a) Explain applications of Gauss's law.

b) Write short note on boundary condition for dielectric - dielectric interface.

c) Explain method of images.

d) Derive the equation for workdone in moving a point charge. Also explain conservative field.

*Q4)* Attempt any two of the following : [2 × 8 = 16]

a) Derive Magnetic field intensity on the axis of circular loop.

b) Explain the concept of vector magnetic potential.

c) Each of the three co-ordinate axis carries a filamentary current of 1A in $\bar{a}x, \bar{a}y$ & $\bar{a}z$ direction. Find $\bar{H}$ at (2, 3, 4).

*Q5)* Attempt any two of the following : [2 × 8 = 16]

a) Derive maxwell's equations for time varying fields.

b) For the space show that intrinsic impedance, $\eta=120\pi$.

c) Calculate the intrinsic impedance $\eta$, the propagation constant $\gamma$, velocity v & skin depth for the given medium. Also check whether the medium is good conductor or not for which $\sigma = 58Ms/m$, $\mu_r = 1$ at frequency f = 100MHz.

*Q6)* Attempt any two of the following : [2 × 9 = 18]

a) Explain smith chart and its applications.

b) The characteristic impedance of a certain line is $710 < -16°$ when the frequency is 1KHz. At this frequency the attenuation 0.01 neper/Km & the phase function is 0.035 radians per km. Calculate the resistance, the leakage, the inductance & the capacitance per Km & velocity of propogation.

c) A lossless transmission line of 50Ω is terminated in 25+j50Ω. Find using smith chart,

i) VSWR

ii) Reflection coefficient

iii) Impedance at 0.3λ from load.

❖❖❖❖

SV - 447

| Seat No. | |
|---|---|

Total No. of Pages : 2

# S.E.(Electronics and Telecommunication) (Part-II) (Semester - IV) Examination, May - 2018

## DATA STRUCTURE (New)

## Sub. Code : 63468

**Day and Date : Friday, 11 - 05 - 2018** **Total Marks : 100**

**Time : 10.00 a.m. to 01.00 p.m.**

**Instructions :** 1) **All questions are compulsory.**

2) **Figure to the right indicate full marks.**

## SECTION - I

*Q1)* Solve any **TWO** from **THREE** **[18]**

a) What is stack? Write algorithm for push operation to save item on stack and explain it in brief.

b) Write 'C' code for

i) Removing element from Queue

ii) Inserting element into Queue

c) What is Data Structure? Discuss briefly different types of data structure.

*Q2)* Solve any **TWO** from **THREE** **[16]**

a) What is Linear search? Write algorithm for linear search in case of an array and explain its time complexity.

b) Describe with 'C' code deletion of nodes from linked list

c) Translate, by inspection, each infix expression to the corresponding postfix and prefix expression

i) (A+B)*D)/(E–F)

ii) A+B/C*(D+E/F–G)+H



*P.T.O*

*Q3)* Solve any TWO from THREE [16]

a) Write the C program for PUSH operation and POP operation

b) What is time space trade off? Explain with example.

c) What is Queue? Explain different types of queue.

## SECTION - II

*Q4)* Solve any TWO [18]

a) Write an algorithm for post order traversal using stacks

b) Explain insertion in m-way search tree with proper example

c) Explain construction of heap tree with example

*Q5)* Solve any TWO [16]

a) Explain binary tree with neat diagram and properties

b) Explain traversing operation on a graph and its types

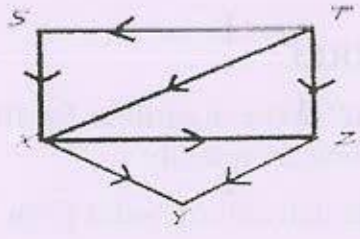
c) Explain insertion of a node in AVL tree with different propositions

*Q6)* Solve any TWO from THREE [16]

a) Write an algorithm for shortest path algorithm.

b) Explain different collision resolution techniques.

c) Consider graph G in the figure below, Suppose the nodes are stored in an array in a memory as follows X,Y,Z,S,T then




i) Find the adjacency matrix A of G.

ii) Find the path matrix P of G.

iii) Is G strongly connected?

SV - 449

| Seat No. | |
|---|---|

Total No. of Pages : 2

# S.E. (Part - II) (ETC) (Semester - IV) Examination, May - 2018
## ANALOG COMMUNICATION SYSTEM
## Sub. Code : 63470

**Day and Date : Wednesday, 16 - 05 - 2018** **Total Marks : 100**

**Time : 10.00 a.m. to 01.00 p.m.**

**Instructions :** 1) **All questions are compulsroy.**
2) **Figures to the right indicate full marks.**
3) **Assume suitable data if necessary.**

## SECTION - I

*Q1)* Solve any three. **[3 × 6 = 18]**

a) Explain need of modulation

b) An AM transmitter operating at carrier frequency of 1 MHZ and modulating frequency of 5 KHZ and modulated at 60% depth delivers a carrier power of 6KW into 50 Ω load, Obtain power delivered to load ,total power of modulated signal in db & watt.

c) Draw and explain high level DSBFC.

d) Describe operation of third method of SSB.

*Q2)* Solve any two. **[2 × 8 = 16]**

a) Comment on pre-emphasis and de-emphasis used in FM.

b) Compare AM with FM.

c) Describe direct method of FM generation

*Q3)* Solve any two. **[2 × 8 = 16]**

a) Define receiver parameters Selectivity, Sensitivity, Fidelity, Dynamic range.

b) Describe TRF receiver comment on limitations.

c) Explain demodulation of SSB.



*P.T.O.*

## SECTION - II

*Q4)* Solve any two [2 × 8 = 16]

a) Write note on FM Noise triangle.

b) Explain Ratio detector.

c) Explain with block diagram double conversion FM receiver.

*Q5)* Solve any two [2 × 8 = 16]

a) Explain flat top sampling also compare with natural sampling

b) Explain thermal noise and partition noise

c) Write note on classification of noise

*Q6)* Solve any three [3 × 6 = 18]

a) Draw and explain PPM modulator and demodulator.

b) Compare PAM with PWM.

c) Explain effect of aliasing in sampling.

d) Explain PCM with block diagram.

▽▽▽▽

SV - 442

Total No. of Pages : 2

| Seat No. | |
|---|---|

# S.E. (Electronics & Telecommunication) (Semester - III)
## Examination, April - 2018
## ANALOG CIRCUITS - I
### Sub. Code : 63461

**Day and Date : Wednesday, 25 - 04 - 2018** **Total Marks : 100**

**Time : 02.30 p.m. to 05.30 p.m.**

**Instructions :**
1) **All questiosns are compulsory.**
2) **Right to figure indicates full marks.**
3) **Use data sheets**
4) **Assume suitable data wherever necessary.**

## SECTION-I

***Q1)*** Solve any two : **[16]**

a) Explain working of high pass filter as a differentiator Design high pass filter for cutoff frequency of 6kHz.

b) What is clamper circuit? Explain the operation of negative clamper in detail.

c) Write short note on voltage trippler.

***Q2)*** Solve any two **[16]**

a) Explain HWR with resistive load Derive expressions for

i) Vdc ii) Vrms

iii) r iv) Rectification efficiency (η)

b) What is need of filter? explain with neat diagram & waveforms capacitor filter in detail.

c) Design power supply using LC filter for following specifications. Vdc = 12v, Idc = 90 mA, r = 0.01.

***Q3)*** Solve any two : **[18]**

a) Explain working of zener shunt regulator and hence design it for $V_0$ = 5.1v, $I_0$ = 50mA, Vin = 7 to 15 V.

b) Design feedback type series pass regulation should provide $V_0$ = 9.4, $I_0$=80mA, Vin = 15 to 20v use transistor $Q_1$ (controller) having hfe = 40 and transistor $Q_2$ (error) having hfe = 110

c) Explain different overload protection circuits used in voltage regulation.

***P.T.O.***

*Q4)* Attempt any two questions. **[16]**

a) Draw and explain hybrid equivalent circuit for CC configuration of transistor.

b) Derive expression for $A_I$, $Y_I$, Av and Ro of $C_E$ amplifier in terms of h-parameter.

c) Derive expression for lower 3dB frequency of CE amplifier by considering coupling capacitor [Cc]. Calculate Cc for $R_1$ = 12KΩ, $R_2$=6.8Ω, hie = 4.5 KΩ, hfe = 320, Rs=400Ω.

*Q5)* Attempt any two questions. **[16]**

a) Draw and explain high frequency model for transistor. Derive expression for $f_B$ and $f_T$ Consider $R_L$.

b) Derive the expression for higher cut off frequency of R-C coupled amplifier considering square wave.

c) Design single stage R-C coupled $C_E$ amplifier Vcc = 12V, hfe = 150, AV = 60, hie = 2.2Ω, frequency range 20kHz, S = 10

*Q6)* Attempt any three question. **[18]**

a) Derive the expression for lower cut off frequency of R-C coupled amplifier considering square wave.

b) Explain the transfer characteristics of n - channel JFET.

c) Explain with circuit self bias for FET.

d) For $C_E$ amplifier has hfe = 100, hie = 2KΩ, hoe = $50 \times 10^{-6}$, hre = $2 \times 10^{-4}$, Rc = 2KΩ, RL = 5.6KΩ, $R_1$ = 10 KΩ, $R_2$ = 4.7 KΩ. Calculate Av, Ai, Yo.

ⓘⓘⓘ

SV - 444

Total No. of Pages : 2

| Seat No. | |
|---|---|

# S.E. (E.&TC) (Semester - III) Examination, April - 2018

## TRANSDUCER & MEASUREMENT (Revised)

## Sub. Code : 63464

**Day and Date : Saturday, 28 - 04 - 2018** **Total Marks : 100**

**Time : 02.30 p.m. to 05.30 p.m.**

### SECTION - I

*Q1)* Attempt any two: **[16]**

a) Define transducer. Explain the various factors for the selection of transducer for a specific application.

b) What is pressure transducer. Explain any one in detail.

c) Explain signal conditioning system.

*Q2)* Attempt any two: **[16]**

a) Explain the electromagnetic flowmeter in detail.

b) Explain the first order LPF and derive the expression for the cutoff frequency.

c) Explain photo transistor in detail.

*Q3)* Write short notes on (any three): **[18]**

a) Active Band stop filter.

b) Thermocouple

c) Null & deflection type instruments.

d) Successive approximation ADC

### SECTION - II

*Q4)* Answer any two: **[16]**

a) Explain various types and sources of errors in measurement system

b) With block schematic and waveforms, explain Integrating type Digital voltmeter.

c) With block diagram explain Logic Analyzer.

*P.T.O.*

*Q5)* Answer any two: **[16]**

a) What is Attenuator? Explain types of Attenuator in detail.

b) A schering bridge has 3300Ω in one arm and its opposite arm has capacitor value of 0.47 uf. The arm to the right of resistor arm is having 1500Ω resistor shunt with 0.33 uf. Capacitor. Opposite to this arm unknown components are connected. Find value of component & its dissipation factor. Assume f = 1000 Hz.

c) Derieve expression for Wien Bridge.

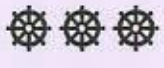
*Q6)* Write short notes (any three) **[18]**

a) CRO Probes

b) De sauty's Bridge

c) Spectrum Analyzer

d) Digital multimeter



SV - 879

| Seat No. | |
|---|---|

Total No. of Pages : 2

# S.E. (Electronics and Telecommunication) (Part - II)
## (Semester - III) Examination, April - 2018
## DIGITAL ELECTRONICS
### Sub. Code : 63462

**Day and Date : Thursday, 26 - 04 - 2018** **Total Marks : 100**

**Time : 02.30 p.m. to 05.30 p.m.**

**Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Assume appropriate data if needed.**

*Q1)* Solve any two of the following. **[16]**

a) Design and implement full adder.

b) Design and implement one bit comparator.

c) Give the specifications of digital IC's & explain propagation delay.

*Q2)* Solve any two of the following. **[16]**

a) Design and implement 4 bit Binary to Gray code converter.

b) Design 8:1 MUX using two 4:1 MUX.

c) Design following logic function using 16: 1MUX with truth table

$F = \Sigma\, m(0,1,3,5,8,11,12,14,15)$

*Q3)* Solve any two of the following. **[18]**

a) Evaluate & minimize following expression using k-map

$F(ABCD)=\Sigma\, m(0,1,4,5,6,7,9,11,15)+d(10,14)$

b) Design & implement 4 bit adder/subtractor using I C7483.

c) Explain Demux/Decoder IC 74138.



*P.T.O.*

*Q4)* Solve any two of the following [16]

a) Explain J-K flip-flop with truth table & circuit diagram & also explain race around condition.

b) Design & implement 3 bit ripple counter.

c) Explain serial In/ serial out shift register (SISO)

*Q5)* Solve any two of the following. [16]

a) Differentiate between TTL & CMOS

b) Draw & explain 4 bit synchronous up-counter.

c) Give general classification of memories & explain any one in brief.

*Q6)* Solve any two of the following. [18]

a) What is CMOS inverter? Explain with help of circuit diagram and input-output characteristics.

b) Generate excitation tables for all the flip-flops.

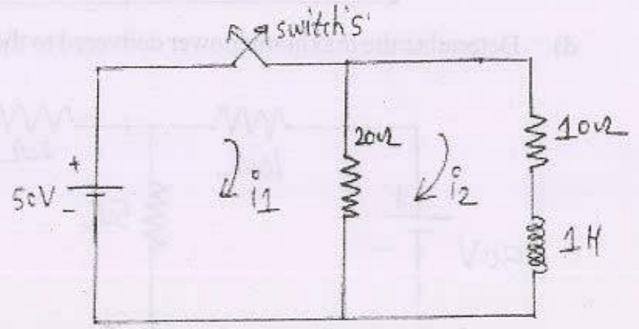
c) Explain Five-bit Johnson counters with timing diagram.

*)6)* a) Derivation equation for characteristic impedance of π - network. **[8]**

b) Design a m - derived high pass filter with a cut off frequency of 10kHz, design impedance of 5Ω and m = 0.4 **[8]**

*)7)* a) Explain a complete response of series R-L circuit for sinusoidal input. **[8]**

b) In the circuit shown, obtain the equations for $i_1(t)$ and $i_2(t)$ when the switch 's' is closed at t = o **[8]**




*)8)* Solve any three.

a) Compare Series resonance and paralled resonance circuit. **[6]**

b) Explain Dc response of RLC series circuit. **[6]**

c) Design constant K-type low pass filter (both T and π sections) having a cutoff frequency of 2kHz to operate with a terminated load resistance of 500Ω **[6]**

d) Design a Band Elimination filter having a design impedance of 600Ω and cut off frequencies $f_1$ = 2kHz and f2 = 6 kHz. **[6]**

ⓘⓘⓘ





Seat No. | | |

Total No. of Pages : 4

**S.E. (Electronics and Telecommunication) (Semester - III)**
**Examination, April - 2018**
**NETWORK ANALYSIS (Revised)**
**Sub. Code : 63463**

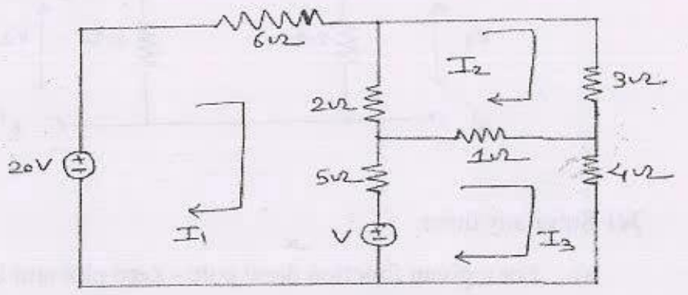
Day and Date : Friday, 27 - 04 - 2018 **Total Marks : 100**
Time : 02.30 p.m. to 05.30 p.m.

Instructions :
1) **Q. No. 4 from section - I and Q. No.8 from section - II is compulsory and solve any two questions from remaining three questions of each section**
2) **Figures to the right indicate full marks.**
3) **Assume suitable data wherever necessary.**

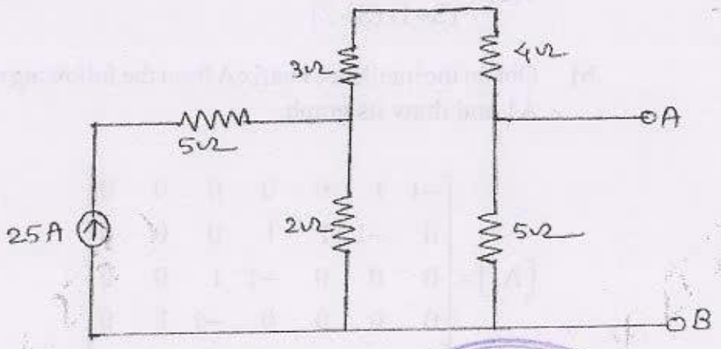
## SECTION - I

*)1)* a) State and prove maximum power transfer theorem for D.C. Network. **[8]**

b) Determine the voltage 'V' which causes the Current $I_1$ to be zero. Use mesh analysis. **[8]**



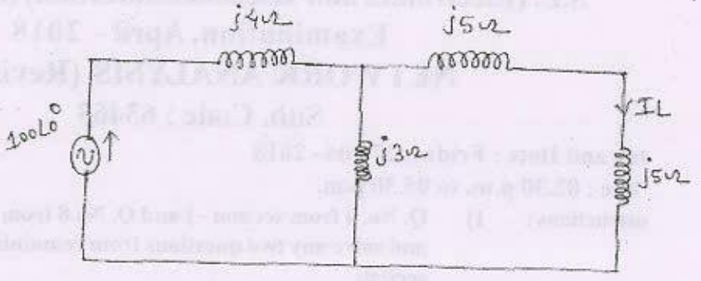

*)2)* a) Determine norton's equivalent circuit for the given circuit. **[8]**





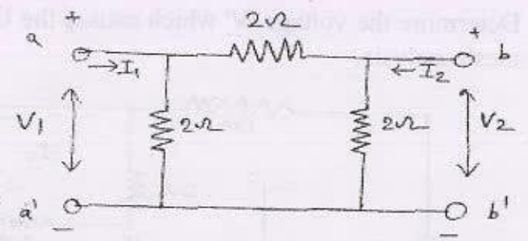

*P.T.O.*

b) For the circuit shown, determine the load current using thevenin's theorem. **[8]**




*23)* a) Obtain ABCD parameters in terms of Y parameters for two port network. **[8]**

b) Find the transmission parameters for given circuit. **[8]**




*24)* Solve any three.

a) For a given function draw pole - Zero plot and find i(t). **[6]**

$$I(S) = \frac{4.5}{(S+1)(S+2)}$$

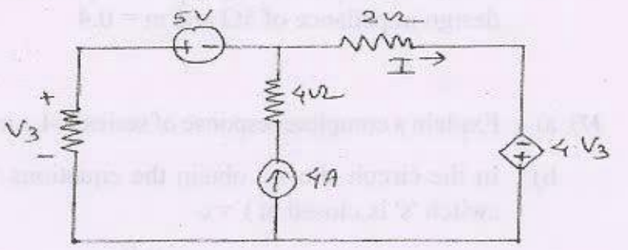
b) Obtain the incidence matrix A from the following reduced incidence matrix A1 and draw its graph. **[6]**

$$[A_1] = \begin{bmatrix} -1 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & -1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & -1 & 1 & 0 \\ 0 & 0 & -1 & 0 & 0 & -1 & 1 \end{bmatrix}$$

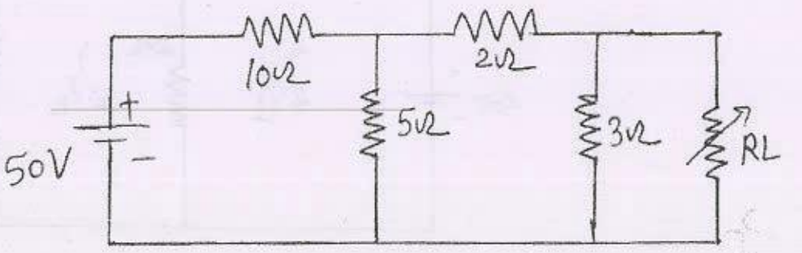




c) Determine the current through the 2Ω resistor using superposition theorem. **[6]**



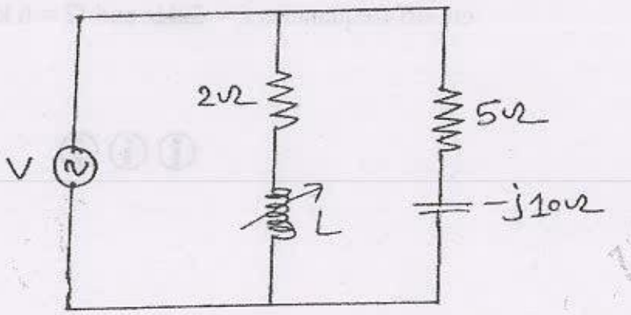

d) Determine the maximum power delivered to the load for given circuit. **[6]**




## SECTION - II

*25)* a) Derive equation of resonant frequency for tank circuit. **[8]**

b) Find the value of L for which the circuit shown, is resonant at a frequency of w = 500 rad/sec. **[8]**



SV - 822

Total No. of Pages : 3

| Seat No. | |
|---|---|

# S.E. (Electronics and Telecommunication Engineering) (Part - II)
## (Semester -III)Examination, April - 2018
## ENGINEERING MATHEMATICS - III
## Sub. Code : 63460

**Day and Date : Tuesday, 24 - 04 - 2018** **Total Marks : 100**

**Time : 02.30 p.m. to 05.30 p.m.**

**Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of non-programmable calculator is allowed.

## SECTION - I

*Q1)* Solve any three of the following:

a) $(D^2 + 4D + 5)y = -2 \cosh x$ [6]

b) $(D^2 - 3D - 4)\, y = e^x \cos x$ [6]

c) $(D^3 - 2D+4)y = 3x^2 - 5x+2$ [6]

d) $\frac{d^2y}{dx^2}+\frac{dy}{dx}=\frac{1}{1+e^x}$ [6]

*Q2)* Attempt any two of the following:

a) find the fourier series for,

$$f(x)=\begin{cases}-\pi, & -\pi < x < 0\\ x, & 0 < x < \pi\end{cases}$$

Hence deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots=\frac{\pi 2}{8}$ [8]

b) Obtain a fourier expression of $f(x) = 2x-x^2$ in intervel (0,2). [8]

c) Obtain half range sine series for [8]

$$f(x)=\frac{\pi}{3}, \quad 0 \le x \le \frac{\pi}{3}$$

$$= 0, \quad \frac{\pi}{3} \le x \le \frac{2\pi}{3}$$

$$=-\frac{\pi}{3}, \quad \frac{2\pi}{3} \le x \le \pi$$



*P.T.O.*

3) Attempt any two of the following:

a) Find Fourier trans form of

$f(x)= 1-x^2, |x|\le 1$

$=0,$ otherwise [8]

b) Find fourier sine and cosine transforms of the function $f(x) = x^{n-1}$. [8]

c) i) find $f(x)$ satisfying following integral equation. [5]

$$\int_0^\infty f(x)\sin sx\,dx = \begin{cases} 1, & 0\le s\le 1 \\ 2, & 1\le s\le 2 \\ 0, & s\ge 2 \end{cases}$$

ii) if $f(x) = \sin px$, where $0 \le x \le \pi$ and p is a positive integer, show that finite Fourier sine transform of $f(x)$, $F_s(n) = 0$ if $n \ne p$. [3]

## SECTION - II

4) Attempt any three of the following:

a) Find $L\left\{\int_0^t \frac{e^{-u}\sin 2u}{u}du\right\}$. [6]

b) Find the Laplace transform of

$f(t)=t, \quad 0<t\le a$

$=2a-t, a<t<2a$

where $f(t)=f(t+2a)$. [6]

c) Evaluate $\int_0^\infty te^{-3t}J_0(4t)dt$, given that $L\{J_0(t)\}=\frac{1}{\sqrt{s^2+1}}$. [6]

d) The current flowing in an electrical circuit is given by $Ri+L\frac{di}{dt}=E$ where E, L and R are constants.Use laplace transform to solve the equation for i given that $i = 0$ when t = 0 [6]





5) Attempt any two of the following:

a) i) By using definition, find the Z-transform of $\{f(k)\}$, where [4]

$f(k)=5^k, k<0$

$=3^k, k\ge 0$

ii) Find the z-transform of $k^2e^{k0}$ [4]

b) Show that $Z\{\cosh h\,\alpha k\}=\frac{z(z-\cosh\alpha)}{z^2-2z\cosh\alpha+1}, k\ge 0.$ [8]

c) Find the inverse Z- transform of $\frac{1}{(z-3)(z-2)}$, for

i) $2<|z|<3$,

ii) $|z|>3$. [8]

6) Attempt any two of the following:

a) Find the directional derivative of $f = xy^2 + yz^3$ at the point (2,–1,1) in the direction of normal to the surface $x \log z - y^2 = -4$ at (-1,2,1). [8]

b) If $\bar{a}$ is a constant vector and $\bar{r} = xi + yj + zk, r = |\bar{r}|$ then [3]

i) Prove that $\nabla(\bar{a}\cdot\bar{r})=\bar{a}$

ii) Evaluate $\nabla^2 e^{r^2}$ [5]

c) Show that the following vector field is irrotational and find the corresponding scalar potential. Also show that it is not solenoidal. [8]

$\bar{F}=(ye^{xy}\cos z)i+(xe^{xy}\cos z)j-(e^{xy}\sin z)k$