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24/11/17

S.Y.B.Tech. Elect - Sem III

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058.
End Sem November 2017

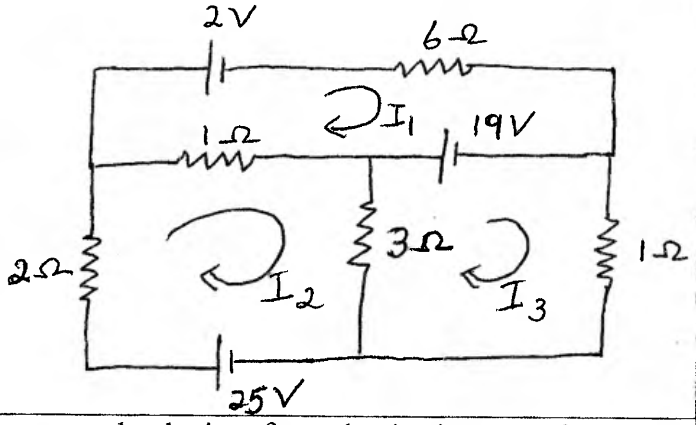
Max. Marks: 100 Duration: 3 hour
Class: S.Y.B.Tech Semester: III Program: Electrical
Name of the Course: Numerical Techniques
Course Code : BTE206

Master file.

Instructions:

- **Question 1 is compulsory**
- Attempt **any 4** questions out of remaining 6 questions.
- Make suitable assumptions wherever necessary

Q. No		Max Marks	Course Outcome Number	Module Number
1 a.	Write Algorithm for Newton Raphson method.	04	1	02
1 b.	State whether the following statement is true or false. Justify: In Euler's method decreasing the step size is required to increase accuracy.	04	3	06
1 c.	Short Note on Golden Ratio.(should include four different examples)	04	1	07
1 d.	Explain Formulation of error with an example.	04	3	01
1 e.	Derive the formula for trapezoidal method upto composite formula.	04	1	05
2a.	Solve the following using simplex method. Maximize $z = 100x + 50y + 50z$ Subject to $4x + 3y + 2z \leq 10$ $3x + 8y + 2z \leq 8$ $4x + 2y + z \leq 6$ $x, y, z \geq 0$	10	1	07
2b.	The current in a D.C. circuit is given by the equation $I^3 - 5I - 7 = 0$. Find the value of the current correct upto two decimal places using bisection method. Use the bracket [2, 3].	10	2	02

<table>
<tr><td>3a.</td><td>Solve dy/dx = y – x with y (0) = 2. Find solution for x = 0.2, 0.4 by 4th order Runge – Kutta method. (take h = 0.2)</td><td>10</td><td>1</td><td>06</td></tr>
<tr><td>3b.</td><td>Solve the following mesh problem to find the mesh currents I1, I2, I3 after 8 iterations using Gauss Seidal. Compare with the actual results and determine the error.
 
</td><td>10</td><td>2,3</td><td>03</td></tr>
<tr><td>4a.</td><td>The upward velocity of a rocket is given as a function of time in Table below
Table : Velocity as a function of time
<table>
<tr><th>t(s)</th><th>v(m/s)</th></tr>
<tr><td>0</td><td>0</td></tr>
<tr><td>10</td><td>227.04</td></tr>
<tr><td>15</td><td>362.78</td></tr>
<tr><td>20</td><td>517.35</td></tr>
<tr><td>22.5</td><td>602.97</td></tr>
<tr><td>30</td><td>901.67</td></tr>
</table>
Determine the value of the velocity at t = 16 seconds using Lagrangian polynomial interpolation</td><td>10</td><td>2</td><td>04</td></tr>
<tr><td>4b.</td><td>A new soda company collected data on their advertising expenditures (measured in Rs. 1000) and the month's sales (measured in Rs. 1000)for the past 6 months
<table>
<tr><td>Advertising</td><td>5.5</td><td>5.8</td><td>6.0</td><td>5.9</td><td>6.2</td><td>6.3</td></tr>
<tr><td>Sales</td><td>100</td><td>110</td><td>112</td><td>115</td><td>117</td><td>116</td></tr>
</table>
What is the linear regression equation? What is the expected sales if the company spends Rs.6,100 in advertising?</td><td>10</td><td>2</td><td>04</td></tr>
<tr><td>5a.</td><td>Explain different types of errors in numerical techniques.
Derive the general error formula.</td><td>05
05</td><td>3</td><td>01</td></tr>
</table>

5b.	The following table gives corresponding values of pressure for specific volume of a superheated steam. v: 2, 4, 6, 8, 10 p: 105, 42.7, 25.3, 16.7, 13 Find the rate of change of pressure with respect to volume when v = 2.	10	2	05
6a.	A curve is drawn to pass through the points given by the following table. x: 1, 1.5, 2, 2.5, 3, 3.5, 4 y: 2, 2.4, 2.7, 2.8, 3, 2.6, 2.1 Estimate the area bounded by the curve, the x-axis and the ordinates x = 1, x = 4.	10	2	05
6b.	Derive the formula for Euler's method and explain its graphical interpretation. Also Discuss the Euler's predictor – corrector method for the solution of a differential equation.	10	1	06
7a.	Using Golden Section search determine the maximum value after the 4th iteration of $f(x) = 2 \sin x - 0.1 x^2$ in the interval [0 , 4] (Consider x in radians)	10	1	07
7b.	Solve the following by Gauss Jordan method $4x1 + 2x2 + 3x3 = 4$ $2x1 + 2x2 + x3 = 7$ $x1 - x2 + x3 = 0$	10	1	03

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27/11/17

S.Y.B.Tech. Elect- Sem III

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

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Munshi Nagar, Andheri (West), Mumbai-400058.
End Semester

Master file.

Course: Soft Computing [AUE02] S. Y. B. Tech(Electical) Sem III

Date: 27/11/2017 Duration : 2 Hr. Max Marks: 60

Q1. Write a MATLAB program to input a square matrix and find sum of normal diagonal, second diagonal, upper triangular and lower triangular elements. (08)

Q2. Write MATLAB code using functions to find whether the entered number is prime or not. (08)

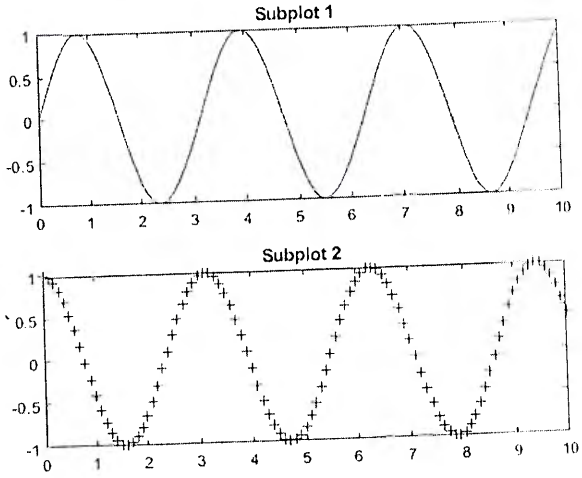
Q3. Write a MATLAB program using functions to print the following (08)

```
1
2  2
3  3  3
4  4  4
```

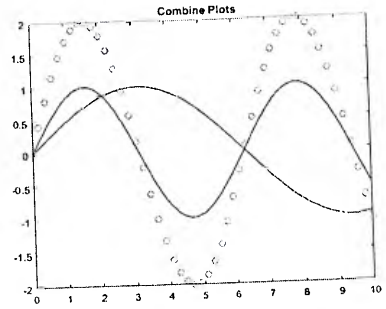
Q4. Write MATLAB code to solve three simultaneous equations using symbolic maths tool box. (06)

Q5. Use "switch" statement and display the input number as positive, negative or zero. (06)

Q6. Write MATLAB code to plot the following figure (08)



Q7. Write MATLAB code to plot the following figure (08)



Q8. Explain how the first order differential equation with non zero initial conditions can be solved using MATLAB (08)

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15/11/17

S.Y.B.Tech. Elect Sem III

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Munshi Nagar, Andheri (West), Mumbai – 400058

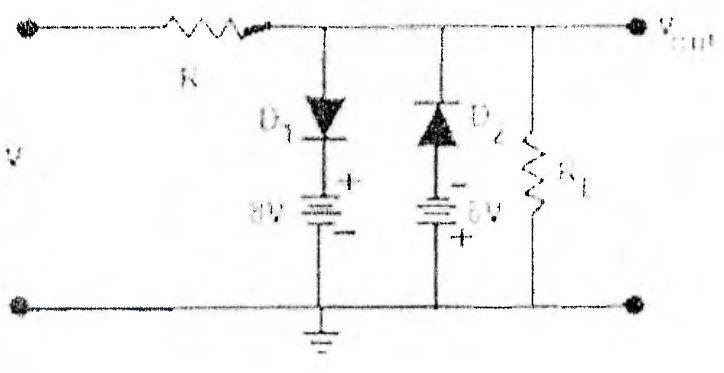
End Sem November 2017

Program: Electrical Engineering
Course code: BTE202
Name of the Course: Electronic Circuits

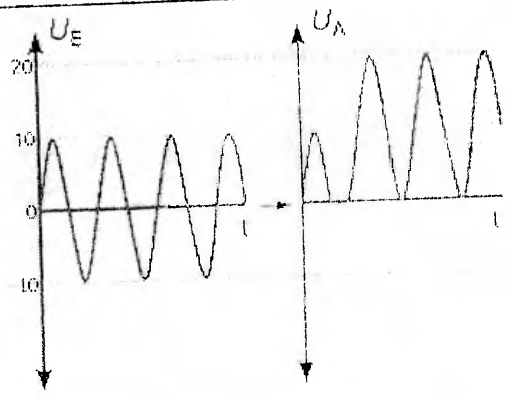
Date :
Duration: 3 Hour
Maximum Marks: 100
Semester: III

Master file.

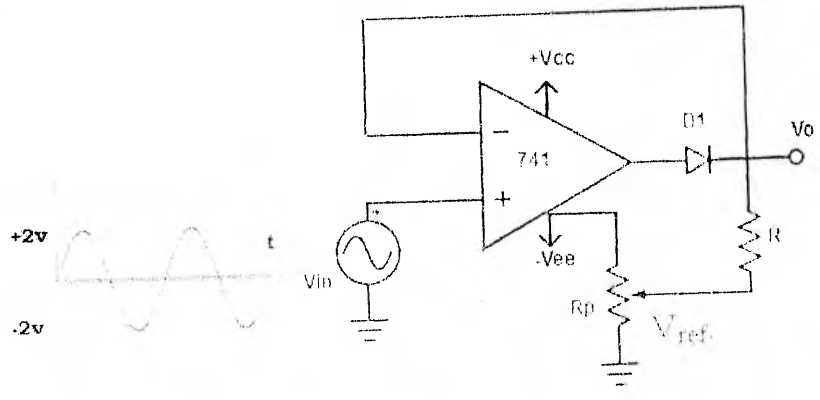
Solve any five questions out of seven

Q. No.		Max Marks	Course Outcome Number	Module No.
1	State whether the following statements are true/false. Justify the same.			
A	Open loop opamp is used as amplifier at low frequency.	05	CO4	06
B	Instrumentation amplifier is used in medical electronics.	05	CO4	06
C	The input impedance of a MOSFET is of the order of several MΩ	05	CO2	03
D	R_E in the differential amplifier can be replaced by properly biased BJT	05	CO3	02 , 04
2 A	Determine the output voltage V_{out} if input voltage V = 10 sin (wt) . Assume Si diodes with cut in voltage 0.7V. 	05	CO1	01
B	Determine the circuit to get the output voltage U_A for the input voltage of U_E. Select proper component values. Explain the same.	05	CO1	01

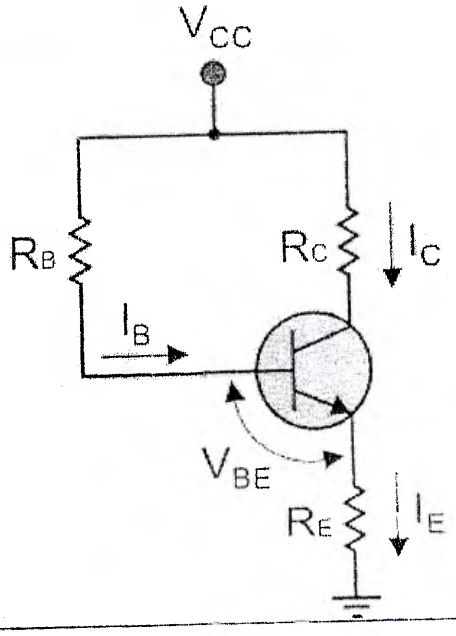
S.Y.B.Tech. Sem III Elect.



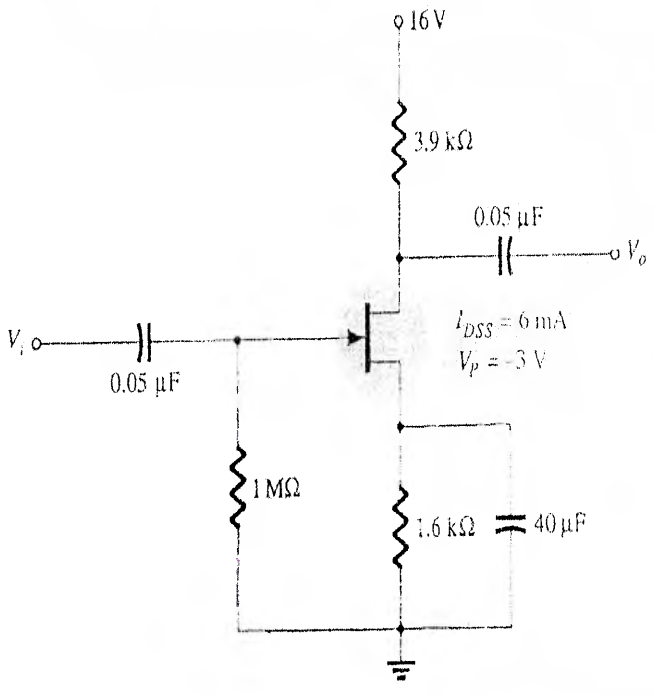
C	Find the output waveform and Explain the same. V_{in} is as shown. V_{ref} is derived from $-V_{EE}$ such that its value is -1V	10	CO1	06



3 A	Determine the quiescent operating point (I_{CQ} & V_{CEQ}) and V_{CE} cut-off & I_C Saturation for the circuit shown below. Given : $\beta = 180$, $V_{CC} = 16$ V, $R_B = 330K\ \Omega$, $R_C = 1100\ \Omega$, $R_E = 550\ \Omega$	05	CO2	02



S.Y.B.Tech. Elect. Sem III

B	In the circuit shown below, determine Quiescent current I_{DQ} and voltage V_{DSQ}. Draw ac equivalent circuit and hence determine the voltage gain if $g_m = 4500\ \mu S$. . 	10	CO2	03
C	The following specifications are given for the dual input, balanced-output differential amplifier : $R_C = 5\ k\Omega$, $R_B = 100\Omega$, $R_E = 500\ \Omega$, $+V_{CC} = 10V$, $-V_{EE} = -10$ V, $h_{ie} = 2\ k\Omega$, $h_{fe} = 50$, $h_{oe} = 5\mu S$. Determine CMRR in dB.	05	CO3	04
4A	Counter type ADC is slower compared to successive Approximation type ADC. Explain this statement.	10	CO3	07
B	Draw and explain block diagram of opamp.	10	CO4	05
5	Draw the neat circuit diagram using opamp showing proper component values to obtain the required output for the input/inputs given as listed below. Explain the same.		CO4	06

	Input applied	Required output	
(i)	V_1 , V_2	$-4 (V_1 + V_2)$	05
(ii)	V_1 , V_2	$-3 (V_1 - V_2)$	05
(iii)	V_1	$I = -V_1/R$	05
(iv)	V_1	$-1/RC (\int V_1\, dt)$	05

S.Y.B.Tech. Elect. Sem III

6A	Explain the following terms w.r.t. opamp IC 741 (i) Slew rate (iv) output resistance (ii) UGB (v) CMRR (iii) Input resistance	10	CO4	05
B	With respect to proper circuit diagram and waveforms explain FWR using opamp.	10	CO4	06
7A	Explain the OPAMP as a Schmitt Trigger. Draw corresponding waveforms. What is UTP and LTP?	10	CO4	06
B	Explain R – 2R ladder type Digital to analog converter.	10	CO3	07

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Lib 13/11/17

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END SEMESTER Examination

November 2017

Maximum Marks: **100** Duration: **3 hour**

Class: **S.Y.B.Tech** Semester: **III** Program:**Electrical Engineering**

Name of the Course: **Engineering Mathematics III** Course Code : **BTE201**

Master file.

Instructions:

- Attempt any FOUR questions out of remaining SIX questions.
- Question number.**1** is **compulsory**.
- Answers to all sub questions should be **grouped** together.

Q		Marks	CO	Module No.
1(a)	If $A=\begin{pmatrix} 2 & 3 \\ -3 & -4 \end{pmatrix}$ prove that $A^{100}=\begin{pmatrix} -299 & -300 \\ 300 & 301 \end{pmatrix}$.	5	4	7
(b)	Find Laplace transforms of $f(t)=\sin^7 t$	5	1	1
(c)	Obtain the Fourier series for $f(x)=\begin{cases} 1+\frac{2x}{\pi} & -\pi < x < 0 \\ 1-\frac{2x}{\pi} & 0 < x < \pi \end{cases}$	5	2	4
(d)	Find the image and draw a rough sketch of the mapping of the region $1 \le x \le 2$ and $2 \le y \le 3$ under the mapping $w=e^z$	5	3	5
2 (a)	Find the eigen values and eigen vectors of the matrix. $A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$	6	4	7

S.Y.B.Tech. Elect. Sem III

(b)	Prove that $\int_0^\infty \frac{\sin 2t + \sin 3t}{te^t} dt = \frac{3\pi}{4}$	6	1	2
(c)	Obtain the half range sine series $f(x) = x(\pi - x) \quad 0 < x < \pi$ Hence show that $\sum_{n=1}^{\infty} \frac{1}{n^6} = \frac{\pi^6}{945}$	8	2	5
3 (a)	Prove that the following function is analytic f(z)=Log(z)	6	3	5
(b)	Show that the matrix $A = \begin{bmatrix} 0 & c & -b \\ -c & 0 & a \\ b & -a & 0 \end{bmatrix}$ satisfies Cayley-Hamilton's theorem	6	4	7
(c)	Find $L\left[\frac{d}{dt}\left(\frac{1-\cos 2t}{t}\right)\right]$	8	1	1
4 (a)	Find the Fourier series for $f(x) = \begin{cases} 0 & -\pi \le x \le 0 \\ x & 0 \le x \le \pi \end{cases}$	6	2	4
(b)	Find the Laplace transforms of f(t), where $f(t) = \begin{cases} t^2, 0 < t < 1 \\ 0, t > 1 \end{cases}$	6	1	1
(c)	If f (z) is a regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)\lvert f(z)\rvert^2 = 4\lvert f'(z)\rvert^2$.	8	3	5
5 (a)	Evaluate: $L^{-1}\left\{\log\left\lvert\frac{s^2+b^2}{s^2+a^2}\right\rvert\right\}$	6	1	2
(b)	Find non – singular matrices P, Q so that PAQ is a normal form where $A = \begin{bmatrix} 2 & 1 & -3 & -6 \\ 3 & -3 & 1 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}$	6	4	6

S Y B.Tech. Elect. Sem III.

(c)	Obtain complex form of the Fourier series for $f(x)=e^{-x} \quad 0\le x\le 2\pi$	**8**	**2**	**4**
6(a)	Evaluate: $L^{-1}\left\{\frac{s^2+2s+3}{(s^2+2s+2)(s^2+2s+5)}\right\}$	**6**	**1**	**2**
(b)	For what values of λ and μ the linear equations. $x+2y+z=8$ $2x+2y+2z=13$ $3x+4y+\lambda z=\mu$ have i)No solution ii) A unique solution iii)infinite number of solutions	**6**	**4**	**6**
(c)	Find the analytic function $f(z)=u+iv$ such that $u-v=e^x(\cos y-\sin y)$	**8**	**3**	**5**
7 (a)	Obtain the half range sine series for $f(x)=\begin{cases}1/4-x, 0<x<1/2\\ x-3/4, 1/2<x<1\end{cases}$	**6**	**2**	**4**
(b)	Evaluate: $L^{-1}\left\{\log\left(1+\frac{1}{s^2}\right)\right\}$	**6**	**1**	**2**
(c)	Solve $y''+9y=\cos 2t$ Given $y(0)=1$ & $y\left(\frac{\pi}{2}\right)=-1$	**8**	**1**	**2**

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17/11/17

S.Y B.Tech Elec A Sem III

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End Sem Exam

Nov 2017

Max. Marks: **100** Duration: **3 hr**

Class: **Second Year** Semester: **III** Program: **Electrical Engineering**

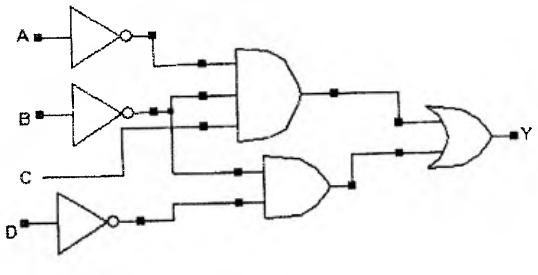
Name of the Course: **Integrated Circuits** Course Code : **BTE204**

Master file.

Instructions:

- **Question No. 1 is Compulsory.**
- Solve any four of remaining six questions.
- Illustrate your answers with neat sketches wherever necessary.
- Assume suitable data if required.
- Preferably, write the answers in sequential order.

Question No.		M.N.	CO	Max. Marks
Q1.				
A)	Convert: 1) $(97)_{10}$ to Excess-3 Code. 2) $(96)_{10}$ to Gray Code. 3) $(11011100.101010)_2$ to Decimal. 4) $(43)_{10}$ to Hexadecimal and BCD.	**1**	**1**	**5**
B)	Write the equation for Y output of figure given below. Minimize the equation using Boolean identity.	**2**	**2**	**5**



S.Y.B.Tech. Elect. Sem III

C)	Convert J-K flip-flop to T flip-flop.	4	3	5
D)	Find the fan out, power dissipation, propagation delay, and noise margin for standard TTL gates. Given: I_{OH} = 400μA, I_{IH} = 40μA, V_{CC} = 5V, I_{CCH} = 1mA, I_{CCL} = 3mA, t_{pHL} = 7ns, t_{pLH} = 11ns, V_{OH} = 2.4V, V_{OL} = 0.4V, V_{IH} = 2V and V_{IL} = 0.8V.	6	4	5
Q2.				
A)	Explain with example subtraction using 2's complement method.	1	1	5
B)	Convert: 1) $(3287.5100098)_{10}$ to Octal. 2) $(33A.22F)_{16}$ to Decimal. 3) $(A72E)_{16}$ to Octal. 4) Multiply 1001 by 1101.	1	1	5
C)	Reduce the following expression using K-map and implement as a SOP using AND/OR gate: $F=\sum (1,3,5,8,9,11,15) + d(2,13)$	2	2	10
Q.3				
A)	Implement OR gate using NAND gate only.	2	2	5
B)	Write short note on Arithmetic Logic Unit.	3	2	5
C)	Draw 8:1 multiplexer using logic gates along with its truth table.	3	2	10
Q.4				
A)	Explain the operation of 4-bit Adder/Subtractor using full adder IC 7483.	3	2	5
B)	Explain the operation of IC 74180 parity checkers/generators. Write its function table.	3	2	5
C)	Design synchronous 3-bit up/down counter using D flip-flop. Draw its timing diagram.	4	3	10
Q.5				
A)	Design a 4-bit twisted ring counter using D flip-flop. Draw timing diagram and calculate propagation delay at last stage, if propagation delay of each flip-flop is 4 μsec.	4	3	10
B)	Define: Setup Time, Hold Time, Propagation Delay, Clock Pulse Width, and Maximum Clock Frequency.	4	3	5
C)	Define sink vertex and source vertex. Draw the state diagram and write state table for J-K flip-flop.	4	3	5

S.Y B Tech. Elect sem III

Q.6				
A)	Explain Serial-In Serial-Out shift register using S-R Flip-Flop. Draw timing diagram with respect to negative edge triggered clock pulse.	**5**	**3**	**10**
B)	Explain Bi-directional shift register using D flip-flop. Draw timing diagram with respect to negative edge triggered clock pulse for shift left operation.	**5**	**3**	**10**
Q.7	**Write short note on:**			
A)	TTL open collector output NAND gate.	**6**	**4**	**5**
B)	ECL	**6**	**4**	**5**
C)	RAM Cell	**7**	**4**	**5**
D)	ROM	**7**	**4**	**5**

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S.Y.B.Tech · Elect · Sem III

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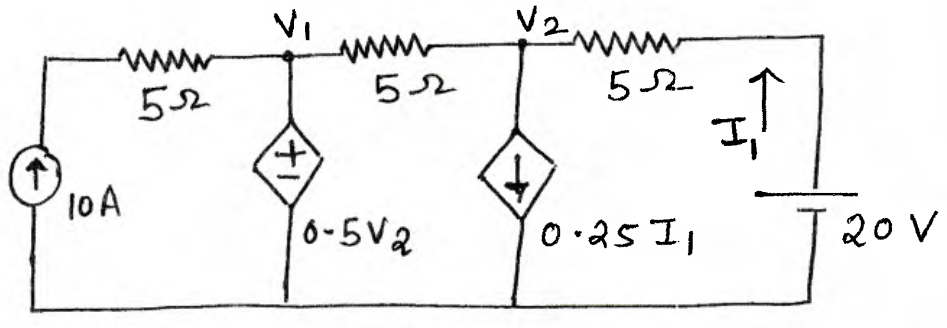
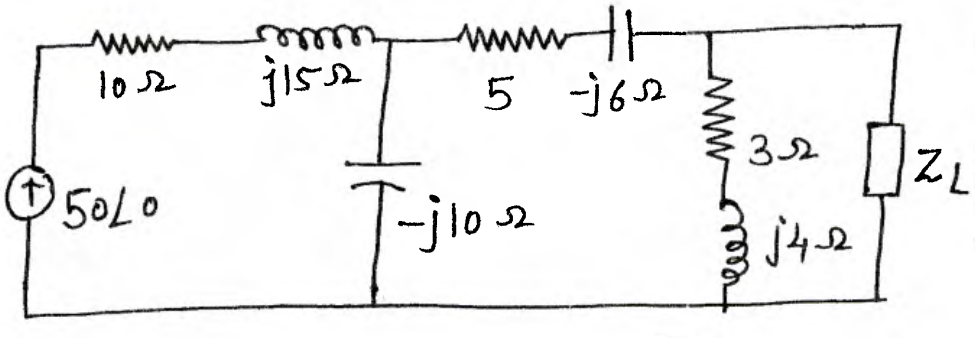
Munshi Nagar, Andheri (West), Mumbai – 400058.
End Semester Examination
November 2017

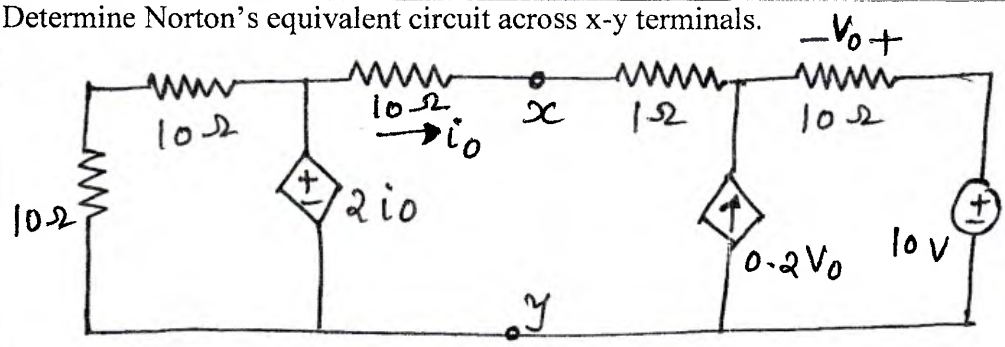
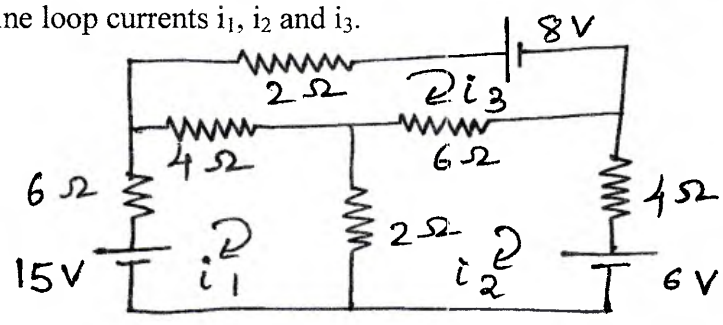
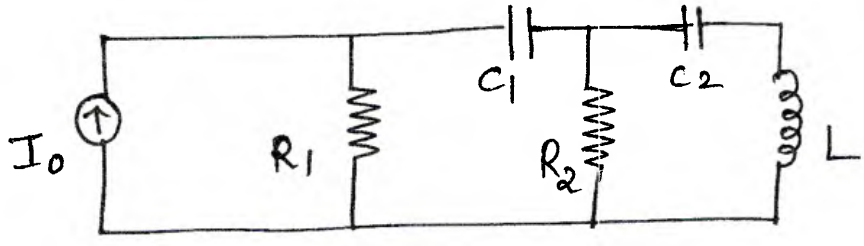
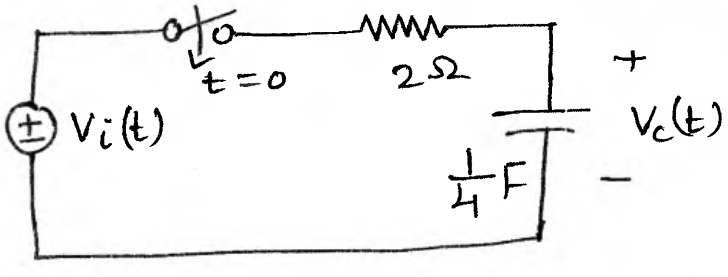
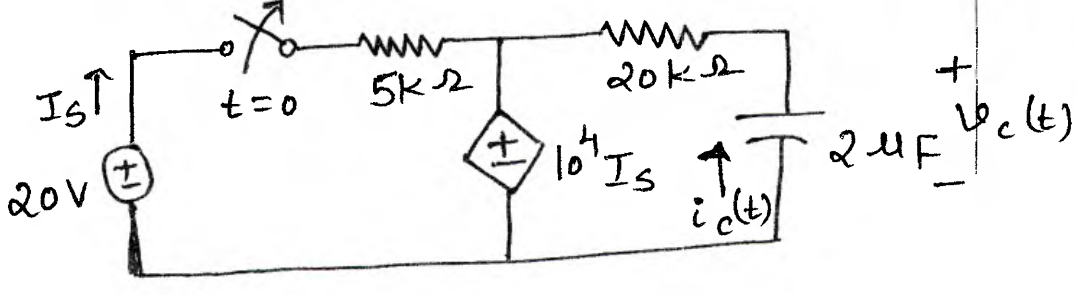
Max. Marks: 100 | Duration: 3 Hr.
Class: SY BTech | Semester: III | Program: Electrical
Name of the Course: **Electrical Networks** | Course Code : **BTE203**

Master file.

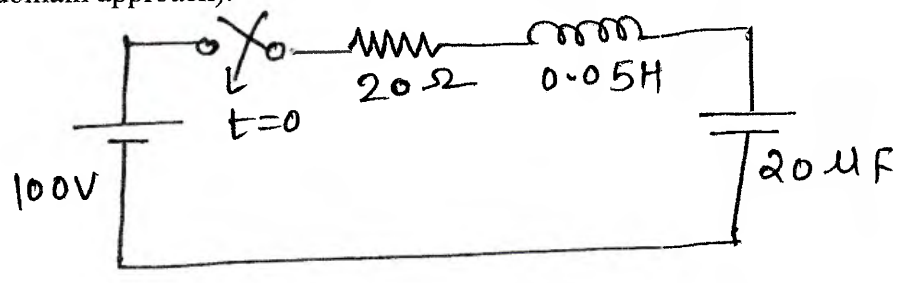
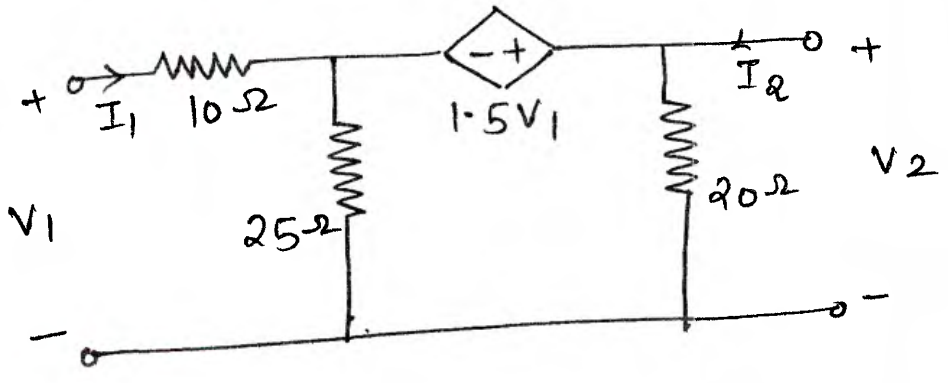
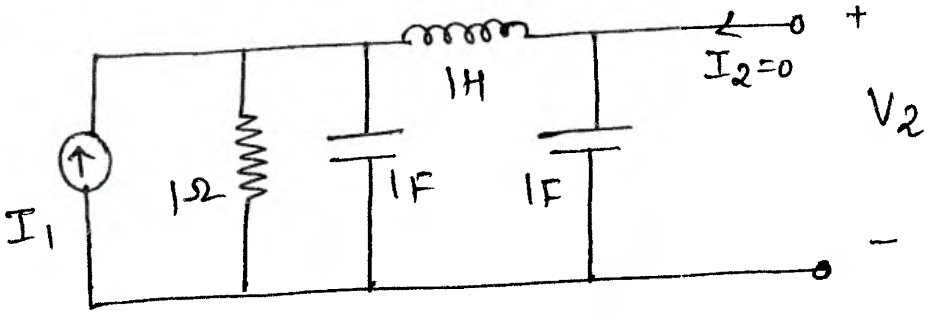
Instructions:

- Attempt any FIVE question out of Seven questions
- Answers to all sub questions should be grouped together
- Figures to the right indicate full marks
- In the absence of any data, make suitable assumptions and justify the same.

Q. No	Question	Max Marks	Mod No.
Q1a	In the network determine voltage V_1 and V_2 using superposition theorem. 	10	01
b	Find Load Impedance Z_L for maximum power transfer. Also determine the maximum power drawn by the load. 	10	01
Q2a	Derive an expression for resonant frequency of a Parallel RLC circuit.	03	03
b	In a series RLC network, R= 100 Ω, L= 0.2H and C = 40 μF. Derive an expression for resonant frequency and calculate the resonant frequency, bandwidth, lower cut-off and upper cut-off frequency.	07	03

c	Determine Norton's equivalent circuit across x-y terminals. 	10	01
Q3a	For the network shown below draw oriented graph. Calculate f-cutset and tieset matrix. Hence determine loop currents i_1, i_2 and i_3. 	11	02
b	For a given network draw dual of the network. 	04	02
c	Test if function $N(s) = \frac{s^3+2s^2+3s+1}{s^3+2s^2+s+2}$ is positive real.	05	07
Q4a	For a given network find $v_c(t)$ if $v_i(t) = \frac{1}{2}\cos(t)u(t)$. (Use Laplace Transform) 	10	04
b	In the network given below switch was initially in closed state. At t=0, switch is opened. Determine and plot the voltage $v_c(t)$ and $i_c(t)$ for $t \geq 0$. Also determine time constant of the circuit. (Use time domain approach). 	10	03

S.Y.B.Tech, Elect. Sem III

Q5a	A series RL network with R=10 ohm and L= 0.2 H is excited with a voltage source with $v(t) = 20\,e^{-2t}\cos(10t + 30^0)$. Determine complex frequency and calculate current in the network using complex frequency analysis.	05	04
b	Determine the number of roots of $F(s) = s^6 + 2\,s^5 + 8\,s^4 + 12s^3 + 20s^2 + 16s + 16$ on the left and on right side of s-plane. Also determine the roots along imaginary axis if any. (Apply Routh-Hurwitz criterion)	05	05
c	In the network given below determine current through inductor for t ≥ 0. (Use time domain approach). 	10	03
Q6a	Determine Z and Y parameters of the given network 	12	06
b	For an electrical circuit as shown below calculate network function $N(s) = \frac{V_2}{I_1}$ and draw pole zero plot of N(s). 	08	05
Q7a	Realize network function $Y(s) = \frac{4(s+2)(s+5)}{s(s+4)(s+6)}$ in Foster I and Foster II form.	10	07
b	Realize network function $Z(s) = \frac{2(s^2+1)(s^2+3)}{s(s^2+2)}$ in Cauer I and II forms.	10	07

S.Y.B.Tech. Elect, Sem III

Lib 22/11/17

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058

End Semester Exam

November 2017

Program: S.Y. B. Tech. **Date: 22/11/2017**

Course code: BTE205 **Duration: 03 Hour**

Semester: III **Maximum Marks: 100**

Master file.

Name of the Course: Electrical Machines – I

Instructions: **1. Question No 1 is compulsory.**

2. Attempt any four questions out of remaining six.

3. Figures to the right indicate full marks.

4. Assume suitable data wherever required and justify the same.

Question No.		Max. Marks	Course Outcome Number	Module No.
Q1	Explain the following. **(Any Four)**			
(a)	Transformer switching current transients.	**05**	**02**	**04**
(b)	Crawling phenomenon in induction motor.	**05**	**03**	**06**
(c)	Construction details & application of dc motor.	**05**	**01**	**07**
(d)	Magnetic properties of material.	**05**	**04**	**01**
(e)	Phasor diagram of transformer with resistance and leakage reactance for lagging p.f. load.	**05**	**02**	**03**
Q2				
(a)	Derive the torque in singly excited magnetic field with respect to electromechanical energy conversion.	**10**	**01**	**02**
(b)	Explain the principle of electromechanical energy conversion and hence the expression of energy stored in magnetic field.	**10**	**01**	**02**
Q3				
(a)	Explain different transformer vector groups in detail with examples.	**10**	**02**	**03**
(b)	Obtain the equivalent circuit parameters of 20 kVA, 2500/250V, 50Hz, single phase transformer referred to L.V. side & H.V. side from the following test data: OC Test | 250V | 1.4A | 105W on L. V. Side SC Test | 104V | 8A | 320W on H. V. Side Draw the equivalent circuit referred to L.V. side.	**10**	**02**	**03**

S.Y.B.Tech. Elect - Sem III

Q4				
(a)	Prove that for the same output and transformation ratio k=N2/N1, an autotransformer requires less copper than an ordinary two winding transformer.	**06**	**02**	**04**
(b)	A 200 kVA transformer has an efficiency of 98% at full load. If the maximum efficiency occurs at three quarters of full load, calculate the efficiency at half load. Assume negligible magnetizing current and pf 0.8 at all loads.	**08**	**02**	**04**
(c)	Two single phase transformers A and B rated at 250 kVA each are operated in parallel on both sides. Percentage impedances for A and B are (1+j6) and (1.2+j4.8) respectively. Compute the load shared by each when the total load is 500 kVA at 0.8 p.f. lagging.	**06**	**02**	**03**
Q5				
(a)	Explain the different methods of speed control of 3-ϕ induction motor.	**10**	**03**	**06**
(b)	A 100 kW, 3-phase, 420V, 6-pole, 50 Hz wound rotor induction motor has a full load slip of 0.04 and the slip at maximum torque of 0.2 when operating at rated voltage and frequency. Neglect stator resistance and rotational losses. Find (a) maximum torque, (b) starting torque and (c) full load rotor ohmic loss.	**10**	**04**	**05**
Q6				
(a)	Write the difference between slip-ring wound and squirrel cage induction motor.	**04**	**03**	**05**
(b)	8-pole, 3-phase, 50 Hz, induction motor is running at a speed of 710 rpm with an input power of 35 kW. The stator losses at this operating condition are known to be 1200W while the rotational losses are 600 W. Find (i) the rotor copper loss, (ii) the gross mechanical power developed (iii) the gross torque developed, (iv) the shaft power output, and (v) the shaft torque.	**08**	**04**	**05**
(c)	What is the role of commutator in dc motor? Hence explain the process of commutation in detail.	**02+06**	**01**	**07**
Q7				
(a)	Draw and explain the speed/torque, torque/armature current and speed/armature current characteristics of dc series motor.	**06**	**01**	**07**
(b)	A 230V dc shunt motor has an armature circuit resistance of 0.4Ω and field resistance of 115Ω. This motor drives a constant load torque and takes an armature current of 20A at 800 rpm. If motor speed is to be raised from 800 to 1000 rpm, find the resistance that must be inserted in the shunt field circuit. Assume magnetization curve to be a straight line.	**07**	**01**	**07**
(c)	What is armature reaction in case of dc machine? Hence explain the demagnetizing and cross-magnetizing effect of it in detail.	**01+03+ 03**	**01**	**07**

S.Y.B.Tech. Elect. Sem III

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(5)

END SEMESTER Examination

November 2017

Maximum Marks: **100** Duration: **3 hour**

Class: **S.Y.B.Tech** Semester: **III** Program:**Electrical Engineering**

Name of the Course: **Engineering Mathematics III** Course Code : **BTE201**

Master file.

Instructions:

- Attempt any FOUR questions out of remaining SIX questions.
- Question number.**1** is **compulsory**.
- Answers to all sub questions should be **grouped** together.

Q		Marks	CO	Module No.
1(a)	If $A=\begin{pmatrix} 2 & 3 \\ -3 & -4 \end{pmatrix}$ prove that $A^{100}=\begin{pmatrix} -299 & -300 \\ 300 & 301 \end{pmatrix}$.	5	4	7
(b)	Find Laplace transforms of $f(t)=\sin^7 t$	5	1	1
(c)	Obtain the Fourier series for $f(x)=\begin{cases} 1+\frac{2x}{\pi} & -\pi<x<0 \\ 1-\frac{2x}{\pi} & 0<x<\pi \end{cases}$	5	2	4
(d)	Find the image and draw a rough sketch of the mapping of the region $1\le x\le 2$ and $2\le y\le 3$ under the mapping $w=e^z$	5	3	5
2 (a)	Find the eigen values and eigen vectors of the matrix. $A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$	6	4	7

S.Y B.Tech. Elet. Sem III

(b)	Prove that $\int_0^{\infty} \frac{\sin 2t + \sin 3t}{te^t} dt = \frac{3\pi}{4}$	**6**	**1**	**2**
(c)	Obtain the half range sine series $f(x) = x(\pi - x) \quad 0 < x < \pi$ Hence show that $\sum_{n=1}^{\infty} \frac{1}{n^6} = \frac{\pi^6}{945}$	**8**	**2**	**5**
3 (a)	Prove that the following function is analytic f(z)=Log(z)	**6**	**3**	**5**
(b)	Show that the matrix $A = \begin{bmatrix} 0 & c & -b \\ -c & 0 & a \\ b & -a & 0 \end{bmatrix}$ satisfies Cayley-Hamilton's theorem	**6**	**4**	**7**
(c)	Find L $\left[\frac{d}{dt}\left(\frac{1-\cos 2t}{t}\right)\right]$	**8**	**1**	**1**
4 (a)	Find the Fourier series for $f(x) = \begin{cases} 0 & -\pi \le x \le 0 \\ x & 0 \le x \le \pi \end{cases}$	**6**	**2**	**4**
(b)	Find the Laplace transforms of f(t), where $f(t) = \begin{cases} t^2, 0 < t < 1 \\ 0, t > 1 \end{cases}$	**6**	**1**	**1**
(c)	If f (z) is a regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)\lvert f(z)\rvert^2 = 4\lvert f'(z)\rvert^2$.	**8**	**3**	**5**
5 (a)	Evaluate: $L^{-1}\left\{\log\left\lvert\frac{s^2+b^2}{s^2+a^2}\right\rvert\right\}$	**6**	**1**	**2**
(b)	Find non – singular matrices P, Q so that PAQ is a normal form where $A = \begin{bmatrix} 2 & 1 & -3 & -6 \\ 3 & -3 & 1 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}$	**6**	**4**	**6**

S.Y.B.Tech. Elect. Sem III

(c)	Obtain complex form of the Fourier series for $f(x)=e^{-x} \quad 0\le x\le 2\pi$	**8**	**2**	**4**
6(a)	Evaluate: $L^{-1}\left\{\frac{s^2+2s+3}{(s^2+2s+2)(s^2+2s+5)}\right\}$	**6**	**1**	**2**
(b)	For what values of λ and μ the linear equations. $x+2y+z=8$ $2x+2y+2z=13$ $3x+4y+\lambda z=\mu$ have i)No solution ii) A unique solution iii)infinite number of solutions	**6**	**4**	**6**
(c)	Find the analytic function $f(z)=u+iv$ such that $u-v=e^x(\cos y-\sin y)$	**8**	**3**	**5**
7 (a)	Obtain the half range sine series for $f(x)=\begin{cases}1/4-x, 0<x<1/2\\ x-3/4, 1/2<x<1\end{cases}$	**6**	**2**	**4**
(b)	Evaluate: $L^{-1}\left\{\log\left(1+\frac{1}{s^2}\right)\right\}$	**6**	**1**	**2**
(c)	Solve $y''+9y=\cos 2t$ Given $y(0)=1$ & $y\left(\frac{\pi}{2}\right)=-1$	**8**	**1**	**2**