Roll No. $\square$
Total No. of Questions: 18

# B.Tech. (ECE) (Sem.-3) <br> NETWORK THEORY <br> Subject Code : UC-BTEC-304-19 <br> M.Code : 78749 

Time: 3 Hrs.
Max. Marks : 60

## INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

## SECTION-A

Write briefly :

1. Relate unit impulse, unit step and unit ramp signals?
2. Draw waveform for the function $f(t)=u(t)-r(t-1)+r(t-2)$.
3. Differentiate between series and parallel resonance.
4. Draw $h$-model for BJT and write its characteristics equations.
5. Under what conditions we can transfer maximum power to the load?
6. How Routh-Hurwitz criterion is helpful in determining of system stability?
7. What are Dirichlet's conditions for Fourier Series?
8. Define image impedance for a 2-port network.
9. What is current division rule?
10. What are transmission parameters? Give characteristic equations.

## SECTION-B

11. Solve following differential equation using Laplace Transform

$$
y^{\prime \prime}-5 y^{\prime}+6 y=0, y^{\prime}(0)=2, y(0)=0
$$

12. In reference to following star-delta equivalent circuits, determine $R_{a}, R_{b}$ and $R_{c}$ in delta connections when $\mathrm{R}_{1}=6 \Omega, \mathrm{R}_{1}=18 \Omega$ and $\mathrm{R}_{1}=3 \Omega$.



FIG. 1
13. Determine Z-parameters for following 2-port network.


FIG. 2
14. Determine and plot output voltage $\mathrm{V}_{0}(\mathrm{t})$ in following circuit when input voltage signal is given by $V_{i}(t)=u(t)-u(t-1)$


FIG. 3
15. Determine if following system $\mathrm{H}(\mathrm{s})$ is a stable system or not. Explain with reasons.

$$
\mathrm{H}(\mathrm{~s})=\frac{s^{4}+2 s^{3}+s^{2}+3 s+4}{s^{5}+3 s^{4}+2 s^{3}+s^{2}+2 s+1}
$$

## SECTION-C

16. Derive conversion formulas for 2-port networks:
a) h -parameters into ABCD-parameters
b) ABCD-parameters into Z-parameters
17. Synthesize following 1-port networks
a) $\mathrm{Z}(\mathrm{s})=\frac{10\left(s^{2}+4\right)\left(s^{2}+25\right)}{s\left(s^{2}+9\right)}$ using Foster-1 Form
b) $\mathrm{Z}(\mathrm{s})=\frac{s^{3}+4 s}{s^{4}+20 s+9}$ using Cauer-1 Form
18. a) Design constant-k (T-section \& $\pi$-section) Low Pass Filters for given cut-off frequency $f_{c}=2000 \mathrm{~Hz}$ and design impedance $\mathrm{R}_{\mathrm{o}}=400 \Omega$.
b) What are the advantages and disadvantages of both constant- k and m -derived filters?

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

