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E – 2305

Reg. No. :

Name :

Third Semester B.Tech. Degree Examination, May 2018
13.302 : SIGNALS AND SYSTEMS (AT)
(2013 Scheme)

Time : 3 Hours

Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **2** marks. **(10×2=20 Marks)**

1. Define deterministic and random signals.
2. What are the different types of representation of discrete-time signals ?
3. What is the necessary and sufficient condition on the impulse response for stability ?
4. Write the Dirichlet condition for existence of Fourier transform of a continuous time signal.
5. Find the Laplace transform of the signal $x(t) = e^{-at} u(t)$.
6. How a distortionless transmission can be achieved ?
7. Define the term aliasing. How it can be eliminated ?
8. Mention the properties of Hilbert transform.
9. Point out the relation between DTFT and Z-transform.
10. Define Region of Convergence of Z-transform.

PART – B

Answer **any one** question from **each** Module. **Each full** question carries **20** marks.

Module – I

11. a) Check whether the following signals are periodic or aperiodic. **10**
 - i) $x(t) = \cos 2t + \sin(t/5)$
 - ii) $x(n) = 3 + \cos \pi/2n + \cos 2n$
- b) Check whether the system is linear, causal, time invariant and/or stable. **10**
 - i) $y(n) = x(n) - x(n - 1)$
 - ii) $y(t) = dx(t)/dt$

P.T.O.



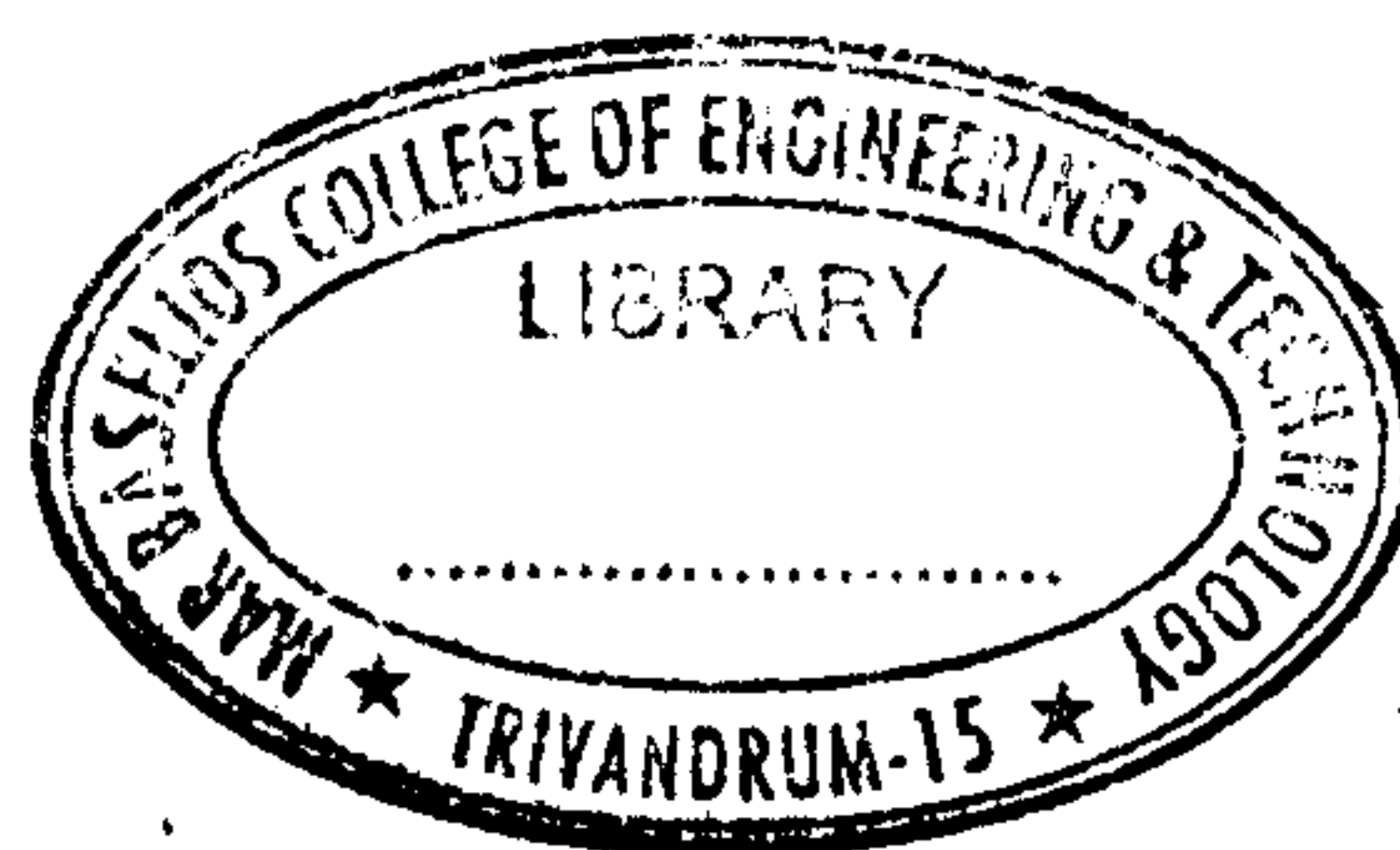
12. a) Find the convolution of the following signals. 10
- i) $x_1(t) = e^{-at} u(t)$ $x_2(t) = e^{-bt} u(t)$
- ii) $x_1(t) = t u(t)$ $x_2(t) = u(t)$
- b) Find the impulse response of the system described by the difference equation. 10
- $$y(n) - 1.5 y(n - 1) + 0.5 y(n - 2) = x(n)$$

Module – II

13. a) Find the Laplace transform and ROC for the following signals. 12
- i) $x(t) = e^{-at} u(t)$
- ii) $x(t) = e^{-bt} u(-t)$
- b) Prove any three properties of Laplace transform. 8
14. a) Find the Fourier series coefficients for the continuous time periodic signal. 12
- $$x(t) = 1.5 \text{ for } 0 \leq t < 1$$
- $$-1.5 \text{ for } 1 \leq t < 2$$
- b) Discuss the relationship between Fourier transform and Laplace transform. 8

Module – III

15. a) State and prove sampling theorem for a band limited signal. 10
- b) Discuss about the phenomena aliasing. How an anti aliasing filter can be designed ? 10
16. a) Derive Hilbert phase splitters. 10
- b) Find the Hilbert transform of $x(t) = \frac{1}{1+t^2}$. 10



Module - IV

17. a) Determine the Z-transform for the following signals. 10
- i) $x(n) = a^{n-1} u(n - 1)$
 - ii) $x(n) = n^2 u(n)$
- b) Derive the relationship between DTFT and Z-transform. 10
18. a) Find Inverse z transform of the signals. 12
- i) $X(z) = \frac{z+1}{z^2 + 3z + 2}$
 - ii) $X(z) = \frac{z+1}{z(z+1)^2}$
- b) Derive the convolution property of z transform. 8
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