BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH **SEMESTER : III**
BRANCH: ECE **SESSION : MO/19**

SUBJECT: EC205 SIGNALS AND SYSTEMS

TIME: 3 HOURS **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) Let $x(t)$ be a complex exponential signal $x(t) = e^{j\omega_0 t}$ with radian frequency ω_0 and fundamental period $T = \frac{2\pi}{\omega_0}$. The discrete time sequence $x(n)$ is obtained by uniform sampling the $x(t)$ with sampling period T_s. Obtain the condition for discrete time sequence $x(n)$ to be periodic. [5]

Q.1(b) Define the following systems (i) Linear (ii) Time-invariant (iii) causal (iv)stable (v) dynamic [5]

Q.2(a) A discrete system is given by the following difference equation $y(n) - 5y(n-1) = x(n) + 4x(n-1)$ where $x(n)$ is the input and $y(n)$ is the output. Find the magnitude and phase response. [5]

Q.2(b) The input and output of causal LTI system are described by the differential equations [5]

$$\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = x(t)$$

(i) Find the transfer function of the system (ii) Find the impulse response of the system.

Q.3(a) Find the inverse Laplace transform of [5]

$$X(s) = \frac{3s^2 + 8s + 6}{(s+2)(s^2 + 2s + 1)}$$

Q.3(b) Using Laplace transform, solve the following differential equations [5]

$$\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{d(t)} + 2y(t) = \frac{dx(t)}{dt} \text{ if } y(0^-) = 2; \frac{dy(0^-)}{dt} = 1 \text{ and } x(t) = e^{-t}u(t)$$

Q.4(a) Explain DTFT and DFT. Find the IDTFT of $X(e^{j\omega}) = 1 + 2e^{-j\omega} + 2e^{-j2\omega} + 3e^{-j3\omega}$. [5]

Q.4(b) Describe briefly Fourier series, Fourier Transform, Laplace transform and Z-transform. [5]

Q.5(a) State and prove the time domain sampling theorem. [5]

Q.5(b) A signal $x(t) = 2\cos(400\pi t + 6\cos 640\pi t)$ is ideally sampled at fs=500Hz. If the sampled signal is passed through an ideal low pass filter with a cut-off frequency of 400Hz.What frequency output will appear in the output? Sketch the output spectrum. Also find the output signal. [5]

:::::29/11/2019:::::M