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| **Name:**<br>**Enrolment No:** | UPES |

# UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

## End Semester Examination, July 2020

**Programme Name: B. Tech-Electrical Engineering** **Semester : IV**
**Course Name : Signal and Systems** **Time : 03 Hrs.**
**Course Code : ECEG-2032** **Max. Marks: 100**
**Nos. of page(s) : 3**

**Instructions:**

1. **Attempt all the questions (Theory, Numerical, Case study etc.) on A4 size blank sheets.**
2. **Attempt all questions serially as per question paper.**
3. **Answer should be neat and clean. Draw a free hand sketch for circuits/tables/schematics wherever required.**
4. **Scan the whole answer script and check the resolution carefully before upload on the blackboard. Note that answer scripts will be considered for evaluation only through Blackboard. No other mode of submission is acceptable.**
5. **You are expected to be honest about each attempt which you make to progress in life.**

**SECTION- A (40 Marks)**

| S. No. | Attempt all the questions. Assume data, if not given. | Marks | CO |
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| Q 1 | **Attempt both the parts:**<br>**(A)** A system is described by the differential equation $\frac{d^2y(t)}{dt^2}+5\frac{dy(t)}{dt}+4y(t)=x(t)$ Determine the response of the system to an input. $x(t)=e^{-2t}u(t)$ .applied at t=0. The initial conditions are $y(0^-)=-2$ and $\frac{dy(0^{-1})}{dt}=-1$<br>**(B)** Given the relationship y(t)= x(t)*h(t) and g(t)=x(4t)*h(4t). If g(t) has the form g(t)= Ay(Bt) then determine the value of A and B respectively. | **10+10** | **CO3, CO2** |
| Q 2 | (A) Determine the system function H(Z) and the frequency response of the system whose impulse response is given as,<br>$$h(n)=\frac{1}{2}\left[\left(\frac{1}{2}\right)^n+\left(-\frac{1}{4}\right)^n\right]u(n)$$<br>Also locate zeros and poles in Z-plane.<br>(B) Let a system be given by $y(n)-2y(n-1)-3y(n-2)=s(n)$<br>Evaluate the output response y(n), when input $s(n)=\delta(n)$ and initial conditions are given as, $y(-1)=0, y(-2)=2$ . | **10+10** | **CO4** |

| SECTION-B (60 Marks) | | | |
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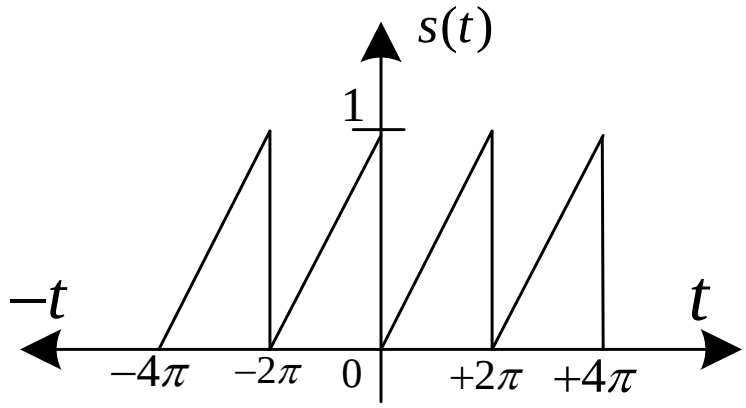
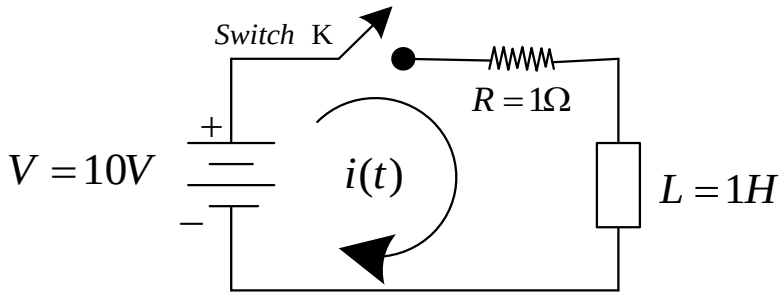
| Q 3 | Find the response of a discrete-time system with unit impulse response:<br>$h(n)=\left\{2,\underset{\uparrow}{1},3\right\}$ to input $s(n)=\left\{1,\underset{\uparrow}{2},3\right\}$ | **10** | **CO1** |
| Q 4 | Find the trigonometric Fourier series for the continuous-time saw tooth wave form in Fig. (1) as,<br>  <br><br>**Fig. (1)** | **10** | **CO2** |
| Q 5 | The transform function H(s) of a causal system is<br>$$H(s)=\frac{2S^2+2S-2}{S^2-1}$$<br>Determine the impulse response. | **10** | **CO3** |
| Q 6 | **Attempt both the parts:**<br>**(A)** Evaluate the inverse Z- Transform of $s(z)=\frac{z}{z-A}$, $\lvert z \rvert > A$<br>Using contour integration method.<br>**(B)** Obtain the particular solution for current i(t) or the given circuit shown in Fig. (2), when switch (K) is closed at time t=0. There is no current through inductor L prior to switching.<br>  <br><br>**Fig. (2)** | **5+5** | **CO4, CO1** |

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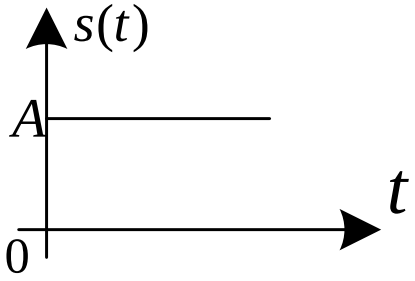
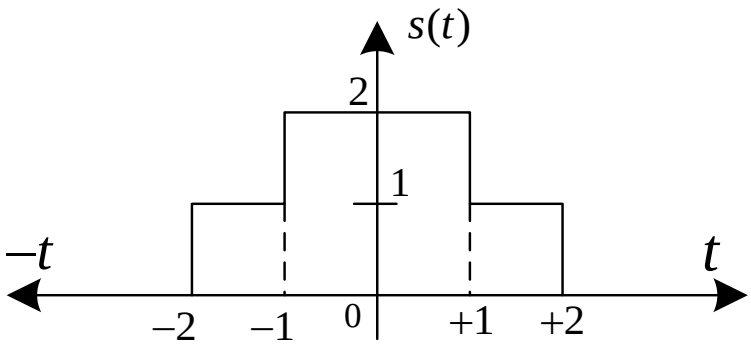
| Q 7 | Classify the signals based on the number of dimensions. Defend with suitable examples. | **5** | **CO1** |
| Q 8 | **Attempt both the parts:**<br>**(A)** Verify whether signal shown in Fig. (3), is a power signal or not?<br>  <br><br>**Fig. (3)**<br>**(B)** The trapezoidal pulse y(t) is related to the x(t) as y(t)= x(10t - 5). Sketch the y(t). | **2.5+2.5** | **CO2** |
| Q 9 | Find the convolution of two continuous-time functions:<br>$s(t) = \mathrm{e}^{-t^2}$ and $\mathrm{h}(t) = 3t^2$ for all t. | **5** | **CO3** |
| Q 10 | Determine the Continuous-time Fourier Transform (CTFT) of the signal shown in Fig. (4)<br>  <br><br>**Fig. (4)** | **5** | **CO4** |