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| **Scheme of Valuation/Answer Key** (Scheme of evaluation (marks in brackets) and answers of problems/key) |
| **APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**FIFTH SEMESTER B.TECH (S) DEGREE EXAMINATION, MAY 2019 |
| **Course Code: AE307** |
| **Course Name: SIGNALS AND SYSTEMS** |
| Max. Marks: 100 |  | Duration: 3 Hours |
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| **PART A**  |
|  |  | ***Answer any two full questions, each carries 15 marks.*** | Marks |
| 1 | a) | (i) Period $T\_{1 }=1/30$Period $T\_{2 }=1/25$$\frac{T\_{1}}{T\_{2}}=\frac{5}{6}$ rational number; Time period=1/5 secPeriodicsignal (ii)$N\_{1}=3, ;N\_{2}=8$, ; $\frac{N\_{1}}{N\_{2}}=\frac{3}{8}$;Time period N =24 ,  Periodic signal | (1)(1)(.5)(1)(1)(.5) |
|  | b) | Equation Steps Energy signal, Energy=25 | (1)(2)(2) |
|  | c) | Diagrams(i) (ii)  | (2)(3) |
| 2 | a) | (i) has memory, causal, not stable (ii) has memory, causal, stable (iii) has memory, not causal, not stable  | (3)(3) (3) |
|  | b) | (i)$ r^{2}+6r+8=0$$$r=-4,-2$$$$y^{\left(h\right)}\left(t\right)=c\_{1}e^{-4t}+c\_{2}e^{-2t}$$(ii)$r^{2}+r+\frac{1}{4}$=0 ; $$r=-\frac{1}{2 } , -\frac{1}{2}$$$$y^{(h)}\left[n\right]=c\_{1}(-\frac{1}{2})^{n}+c\_{2}n(-\frac{1}{2})^{n}$$ | (1)(1)(1)(1)(1)(1) |
| 3 | a) | (i)EquationDiagram Steps&Calculation$$y\left(n\right)=\frac{4}{3}-\frac{1}{12}(\frac{1}{4})^{n };n\geq -2 $$$$=0;n\leq -2$$(ii)EquationDiagram&calculation{6,5,3,11,14,6} | (1)(2)(2.5)(2)(1)(5)(1.5) |
| **PART B**  |
| ***Answer any two full questions, each carries 15 marks.*** |
| 4 | a) | Diagram of system, magnitude and phase responseEquation and explanation of both continuous time and discrete time signals | (1.5)(6) |
|  | b) | Sampling theorem Aliasing | (4)(3.5) |
| 5 | a) | Hilbert Transform Equation Any two properties | (3)(4) |
|  | b) | (i)Steps  N=17$$\left\{\begin{array}{c}\frac{1}{2}e^{j\frac{π}{3}} ;k=3\\\frac{1}{2}e^{-j\frac{π}{3}} ;k=-3\\0 ; otherwise on k=\left\{-8,-7,………….8\right\}\end{array}\right.$$(ii) Steps N=19$$\left\{\begin{array}{c}\frac{1}{2} k=-5; \\ j k=-2\\1 k=0; \\ -j k=2\\\frac{1}{2} k=5\\0 otherwise on k=\left\{-9,-8,…………9\right\}\end{array}\right.$$ | (1.5)(1.5)(2)(3) |
| 6 | a) | Equation and steps$$X\left(jΩ\right)=\frac{0.75}{1.25-cosΩ}$$ | (4)(1) |
|  | b) | Equation and steps$$x\left(t\right)=\frac{8}{10+6cos⁡(t)}$$ | (4) (1) |
|  | c) | EquationProof |  (1)(4) |
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| **PART C**  |
| ***Answer any two full questions,each carries 20 marks.*** |
| 7 | a) | (i)Definition and steps$$X\left(s\right)=\frac{1}{s-a ,}Re\left(s\right)>a$$(ii)Definition and Steps$$X\left(s\right)=-\frac{e^{-3\left(s-5\right)}}{s-5} ; Re(s)<5$$ | (4)(1)(4)(1) |
|  | c) | (i) Definition and steps$$X\left(z\right)=-\frac{z}{z-\frac{1}{a}}+\frac{z}{z-a }, ROC :\left|a\right|<\left|z\right|<\frac{1}{\left|a\right|}$$(ii) Definition and steps$$X\left(z\right)=\frac{z(2z-\frac{1}{6 })}{\left(z-\frac{1}{2}\right)\left(z+\frac{1 }{3}\right) ,}\left|z\right|>\frac{1}{2}$$Poles are at z = 1/2 and z = -1/3 Zeros are at z = 0 and z = 1/12 | (3)(1)(4)(1)(1) |
| 8 | a) | (i)Steps$$X\left(z\right)=\left(\frac{1}{1-\frac{1}{2 }z^{-1}}\right)\left(\frac{1}{1-2z^{-1}}\right), \frac{1}{2}<\left|z\right|<2$$(ii)Steps$$x\left[n\right]=\left[2\left(\frac{1}{2}\right)^{n}-\left(\frac{-1}{3}\right)^{n}\right]u[n]$$ | (4)(2)(3)(1) |
|  | b) | Steps$$h\left(t\right)=\frac{1}{3}e^{2t}u\left(t\right)-\frac{1}{3}e^{-t}u(t)$$ | (4)(1) |
|  | c) | Causality Explanation.Stability Explanation | (2.5)(2.5) |
| 9 | a) | (i) Steps$$x\left(t\right)=-2e^{-2t}u\left(t\right)+3e^{-3t}u(t)$$(ii)Steps$$x\left(t\right)=\left[2-3e^{-2t}+e^{-t}\right]u(t)$$ | (4)(1)(4)(1) |
|  | b) | Steps$x\left[n\right]= -2(\frac{1}{2})^{n }$u[-n-1] - $(\frac{-1}{3})^{n }u\{n\}$ | (4)(1) |
|  | c) | Steps $y\left[n\right]-\frac{5}{6}y\left[n-1\right]+\frac{1 }{6}\left(n-2\right)=x\left[n\right]+\frac{3}{2 }x\left[n-1\right]-\frac{2}{3}x[n-2]$Find H(z)= Y(z)/X(z) | (3)(2) |
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