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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 DEGREE EXAMINATION(S), MAY 2019 |
| **Course Code: EC301** |
| **Course Name: DIGITAL SIGNAL PROCESSING** |
| Max. Marks: 100 |  | Duration: 3 Hours |
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| **PART A**  |
|  |  | ***Answer any two full questions, each carries 15 marks.*** | Marks |
| 1 | a) | 4 – DFT answer 4 – DFT magnitude response8 – DFT answer 8 – DFT magnitude responseAs N increases resolution of spectrum increases. Proper explanation by analyzing magnitude response. | (3) (1)(3) (1)(2) |
|  | b) | Stating property accuratelyIdentifying unknowns using complex conjugate propertyUsing parsevell’s theorem energy = 1.75 J | (1)(2)(2) |
| 2 | a) | Answer y( n ) = {2, 8, 20, 32, 44, 56, 68, 80, 92, 104, 94, 60}Dividing blocks and individual convolution calculationCombining blocks and correct final answer | (2)(2)(2) |
|  | b) | LTI system response is linear convolution Perform linear convolution using circular convolution after zero paddingFinal answer correct | (1)(2)(1) |
|  | c) | DFT is self dual.DFT[DFT(x(n))] = Nx((-n))4 = {4, 16, 12, 8} | (2)(3) |
| 3 | a) | 4 stages – check the inputs , twiddle factor and connections of each stage (2 marks for each stage )Over all flow diagram neatness | (8)(2) |
|  | b) | Correct explanation using necessary equationsPartially correct (give marks accordingly) | (5) |
| **PART B**  |
| ***Answer any two full questions, each carries 15 marks.*** |
| 4 | a) | Magnitude response correctPhase response correctDerivation without final result | (2)(2)(1) |
|  | b) | Calculating hd(n) using IDFT equationMultiplying using Hamming windowFinal answer in realizable form {h(0) to h(6)} = {0.0085, 0, 0.2451, 0.5, 0.2451, 0.085 } | (2)(2)(2) |
|  | c) | Complete and correct explanationPartially correct( give marks accordingly) | (4) |
| 5 | a) | Using proper equation to get h(n) expressionSystem is symmetric hence we need to calculate only h(0) to h(7) remaining values are repetitions. Give 1 mark for each correct value{-0.01413, -0.001945, 0.04, 0.01233, -0.091388, -0.0180898, 0.313318, 0.52 } | (2)(8) |
|  | b) | Correct derivation of proof | (5) |
| 6 |  | Analog passband edge frequency =.6498 rad/secAnalog stopband edge frequency = 2.2675rad/secOrder calculation = 2Normalised H(s) for N = 2Cutoff frequency = 0.9107 rad/secH(s) = 0.8297 /(S2+1.2886S +0.8297)$$H\left(z\right)=\frac{0.1120+0.224z^{-1}+0.112z^{-2}}{1-0.856 z^{-1}+0.3041z^{-2}}$$ | (1)(1)(2)(1)(2)(3)(5) |
| **PART C**  |
| ***Answer any two full questions, each carries 20 marks.*** |
| 7 | a) | H(z) calculationSplitting H(z) using W(z) in numerator and denominatorDirect form structure for y(n) and w(n)Combining these structures making use of common delay element | (2)(2)(4)(2) |
|  | b) | Architecture block diagram | (5) |
|  | c) | Direct form 2 structureSignal flow graphTransposed direct form structure | (2)(1)(2) |
| 8 | a) | Obtain the lattices ( 3 lattices)h(n) = {1, 1/2, 1/4, 1/8} | (6) |
|  | b) | Transposition theoremoperations needed to perform to obtain transpose of a structure | (2)(4) |
|  | c) | H(z) calculationDirect form2 structureObtain H1(z) and H2(z)Cascade form structure | (2)(2)(2)(2) |
| 9 | a) | Detailed explanation covering all points.For partial explanation give marks accordingly | (10) |
|  | b) | Fast Multiply and accumulate unit, Multiple access memory architecture, specialized addressing modes, specialized instruction sets, special peripherals | (5) |
|  | c) | Proper ExplanationFor partial explanation give marks accordingly | (5) |
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