|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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 | |
|  | | | | | |
| **PART A** | | | | | |
|  |  | ***Answer any two full questions, each carries 15 marks.*** | | | Marks |
| 1 | a) | 4 – DFT answer  4 – DFT magnitude response  8 – DFT answer  8 – DFT magnitude response  As N increases resolution of spectrum increases. Proper explanation by analyzing magnitude response. | | | (3)  (1)  (3)  (1)  (2) |
|  | b) | Stating property accurately  Identifying unknowns using complex conjugate property  Using 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 calculation  Combining blocks and correct final answer | | | (2)  (2)  (2) |
|  | b) | LTI system response is linear convolution  Perform linear convolution using circular convolution after zero padding  Final 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 equations  Partially correct (give marks accordingly) | | | (5) |
| **PART B** | | | | | |
| ***Answer any two full questions, each carries 15 marks.*** | | | | | |
| 4 | a) | Magnitude response correct  Phase response correct  Derivation without final result | | | (2)  (2)  (1) |
|  | b) | Calculating hd(n) using IDFT equation  Multiplying using Hamming window  Final 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 explanation  Partially correct( give marks accordingly) | | | (4) |
| 5 | a) | Using proper equation to get h(n) expression  System 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/sec  Analog stopband edge frequency = 2.2675rad/sec  Order calculation = 2  Normalised H(s) for N = 2  Cutoff frequency = 0.9107 rad/sec  H(s) = 0.8297 /(S2+1.2886S +0.8297) | | | (1)  (1)  (2)  (1)  (2)  (3)  (5) |
| **PART C** | | | | | |
| ***Answer any two full questions, each carries 20 marks.*** | | | | | |
| 7 | a) | H(z) calculation  Splitting H(z) using W(z) in numerator and denominator  Direct 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 structure  Signal flow graph  Transposed 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 theorem  operations needed to perform to obtain transpose of a structure | | | (2)  (4) |
|  | c) | H(z) calculation  Direct form2 structure  Obtain 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 Explanation  For partial explanation give marks accordingly | | | (5) |
| \*\*\*\* | | | | | |