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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: EC303**

**Course Name: APPLIED ELECTROMAGNETIC THEORY (EC)**

Max. Marks: 100

Duration: 3 Hours

*(Smith Chart to be supplied on request)*

**PART A**

*Answer any two full questions, each carries 15 marks.*

- |      |  | Marks |
|------|--|-------|
| 1 a) | Given $D = 2r \cos\Phi a_\Phi - (\sin\Phi/3r) a_z$ . Find flux crossing portion of $z=0$ plane defined by $r \leq a$ , $0 \leq \Phi \leq \pi/2$ .  | (7)   |
| b)   | Let $\mu_{r1}=3$ , region is defined by $x < 0$ and region2, $x > 0$ has $\mu_{r2}=5$ . If $H_1=4ax+3ay-6az$ A/m, find $H_2$ and the angle it makes with normal.   | (8)   |
| 2 a) | In spherical coordinates, $V=-25$ on a conductor at $r=2$ cm and $V=150$ at $r=35$ cm. the space between the conductors is dielectric filled for which $\epsilon_r=3.12$ . Find surface charge densities on the conductors.                  | (7)   |
| b)   | A travelling wave is described by $y = 10 \sin(\beta z - \omega t)$ . Sketch the wave at $t=0$ , $t=t_1$ and $t=t_2$ where it advanced by $\lambda/8$ and $\lambda/4$ respectively. Velocity is $3 \times 10^8$ m/s and $\omega=10^6$ rad/s. | (8)   |
| 3 a) | Derive the capacitance and inductance of a two-wire line.  | (8)   |
| b)   | Write Maxwell's equation in phasor form.   | (4)   |
| c)   | Draw electromagnetic flow diagram showing the relationship between potentials and vector fields of electromagnetic system (time varying case).   | (3)   |

**PART B**

*Answer any two full questions, each carries 15 marks.*

- |      |   |     |
|------|---|-----|
| 4 a) | In free space ( $z \leq 0$ ) a plane wave with $H=10 \cos(10^8 t - \beta z) a_x$ mA/m is incident normally on a lossless medium ( $\epsilon=2\epsilon_0, \mu=8\mu_0$ ) in the region $z \geq 0$ . Determine $E_r$ , $H_r$ and $E_t$ , $H_t$ | (8) |
| b)   | Describe the following terms:<br>i) Characteristic impedance    ii) Lumped and distributed elements   | (7) |
| 5 a) | Derive the expression for refraction and reflection coefficient of plane electromagnetic waves that undergoing oblique incidence with vertical polarization (considering boundary separation).  | (7) |
| b)   | Derive the ABCD parameters of a transmission line.  | (8) |
| 6 a) | An EM wave travels in free space with electric field component $E_s=100e^{j(0.866y+0.5z)} a_x$ V/m. Determine $\omega$ , $\lambda$ , magnetic field component and time average power in the wave.   | (8) |
| b)   | A distortion less line has $Z_0=60\Omega$ ; $\alpha=20$ mNp/m; $u=0.6c$ . Find R,L,G,C and $\lambda$ at 100MHz.   | (4) |

- c) Distinguish between lossless line and distortion less line. (3)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) Write note on half wave and quarter wave transmission lines. (5)  
b) A lossless  $60\Omega$  line is terminated by a  $60 + j60\Omega$  load. Find  $\Gamma$  and  $s$ , if  $Z_{in} = 120 - j60\Omega$ . How far is the load from generator (Solve with Smith chart)? (6)  
c) What are called degenerate modes? Explain. (5)  
d) Draw the field distribution pattern for  $TE_{20}$  mode inside a rectangular waveguide. (4)
- 8 a) Draw the input impedance variation of lossless line when shorted and opened for a  $0$  to  $2\pi$  variation in phase. (3)  
b) Design a stub to match  $40 + j30\Omega$  load (antenna) to a lossless line of  $100\Omega$  (use Smith chart). (9)  
c) List all the modes which are supported in rectangular waveguides and why? (8)
- 9 a) From Maxwell's equation derive the expression for E fields and H fields inside the waveguide for TE mode. (8)  
b) By analytical method, get the value of position where stub has to be placed from load and stub length with single stub impedance matching in transmission lines. (7)  
c) Derive the relationship between guide wavelength, free space wavelength and cut off wavelength in rectangular waveguide. (5)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY  
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: EC361**

**Course Name: DIGITAL SYSTEM DESIGN (EC, AE)**

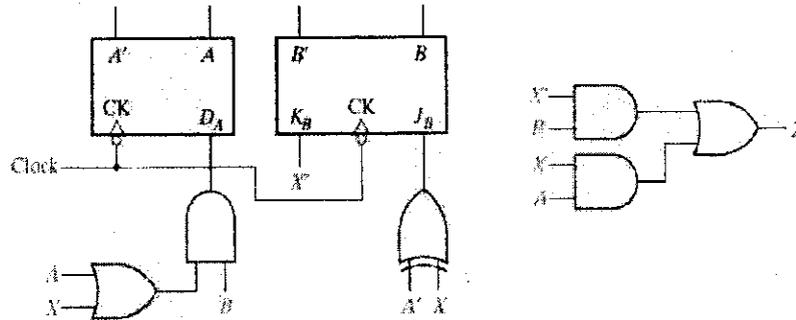
Max. Marks: 100

Duration: 3 Hours

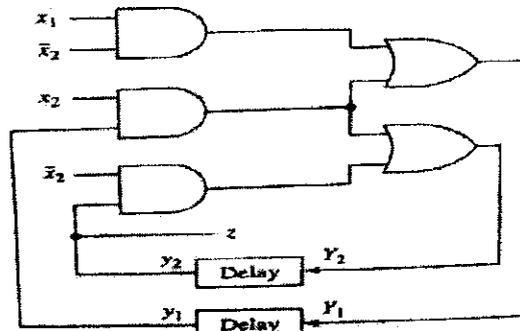
**PART A**

*Answer any two full questions, each carries 15 marks.*

- 1 a) Analyse the following sequential network. Derive the next state and output equations. Obtain its transition table and state table. Marks (7.5)



- b) Analyse the asynchronous sequential network shown in figure, by forming the excitation/transition table, state table, flow table, and flow diagram. The network operates in the fundamental mode with the restriction that only one input variable can change at a time. (7.5)



- 2 a) Draw the ASM chart for a mod 8 binary up-down counter (7.5)  
 b) One type of clocked T-Flip-flop works as follows: (7.5)  
 The flip-flop has two inputs, T and P. The flip-flop will change state if T=1 when the clock(P) changes from 1 to 0. Under all other conditions, Q should remain constant. Assume that T and P do not change simultaneously. Obtain a minimal flow table.  
 3 a) Reduce the following State table using implication chart. (7.5)

Present State	Next State		Present Output
	X=0	1	
a	d	c	0
b	f	h	0
c	e	d	1
d	a	e	0
e	c	a	1
f	f	b	1
g	b	h	0
h	c	g	1

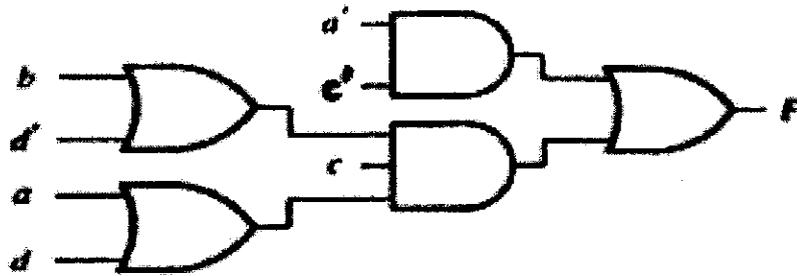
- b) The reduced flow table shown below for a fundamental mode asynchronous sequential network. Determine a state assignment involving a minimum number of variables that allows a realization free of critical races. Construct the corresponding transition table and obtain the minimal-sum expressions for realisations using feedback loops. Assume that both the inputs won't change simultaneously (7.5)

Present State	Next state				Output(z)			
	Input State( $x_1, x_2$ )				Input State( $x_1, x_2$ )			
	00	01	10	11	00	01	10	11
1	①	①	4	①	0	0	-	0
2	②	1	3	-	1	-	-	-
3	2	③	③	③	-	1	1	1
4	1	-	④	3	-	-	0	-

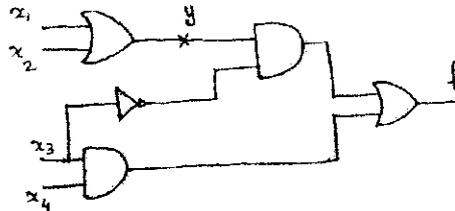
**PART B**

*Answer any two full questions, each carries 15 marks.*

- 4 a) Find all of the static hazards in the following network. For each hazard, specify the values of the variables which are constant and the variable which are changing. Indicate how all of these hazards could be eliminated by adding gates to the existing networks. (7.5)



- b) For the given circuit, find the tests to detect the faults  $x_3$  S-A-0,  $x_3$  S-A-1,  $y$ S-A-0 and  $y$ S-A-1. (7.5)



- 5 a) Explain Essential hazards in asynchronous sequential networks. What are the constraints to be satisfied to avoid Essential hazards? (7.5)  
 b) Explain Kohavi algorithm. (7.5)  
 6 a) Differentiate positive skew and negative skew. (3.5)  
 b) Explain Jitter. What causes Jitter? (4)  
 c) Explain different test pattern generation for BIST. (7.5)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) Explain different kinds of PLA folding. (10)

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- b) Draw and explain the architecture of Xilinx 9500-family CPLDs. Also explain the function block architecture. (10)
- 8 a) Describe the different test generation techniques for PLA. (10)
- b) Explain the internal structure of an XC4000-series CLB. (10)
- 9 a) Explain different testable PLA Designs. (10)
- b) Using suitable illustrations explain the XC4000 programmable interconnect. (10)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

**Course Code: EC365**

**Course Name: BIOMEDICAL ENGINEERING (EC)**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) Explain with necessary diagram how action potential is generated in human body and write the nernst equation for resting membrane potential. (7)
- b) The intracellular  $k^+$  concentration of a group of cells averages  $140 \times 10^{-6}$  moles/cm<sup>3</sup>. The extracellular concentration of  $k^+$  averages  $4 \times 10^{-6}$  moles/cm<sup>3</sup>. Find:  
i) Concentration ratio ii) Diffusion potential for  $k^+$  (3)
- c) Explain the following: (3)  
i) Half cell potential ii) Ag-AgCl electrode.
- d) What are the essential features required for bio-potential amplifiers? (2)
- 2 a) With a neat sketch explain the working of human heart. (7)
- b) Draw a typical ECG signal and mark its amplitude and time. (2)
- c) Explain the principle, lead configuration and recording system of ECG. (6)
- 3 a) With the help of a diagram explain any one direct method for the measurement of blood pressure. (7)
- b) Explain the basic principle of electromagnetic blood flow meter and with neat sketch explain Ultrasonic blood flow meter. (8)

**PART B**

*Answer any two full questions, each carries 15 marks.*

- 4 a) List the different waves in EEG recording and explain the 10-20 lead system used to record EEG. (4)
- b) With neat sketch explain any two types of electrodes used in EEG recording (3)
- c) Explain how nerve conduction velocity is calculated? An EMG signal has the following specifications. Maximum signal amplitude 3mV and bandwidth 20 to 3000 Hz. Draw the block diagram of EMG measurement and explain the need for each block. (8)
- 5 a) List any four human respiratory parameters and define each in two lines and explain how spirometer can be used for respiratory volume measurement. (8)

- b) Explain any one method to measure blood cell count. (4)
- c) What is Flame photometer? (3)
- 6 a) Explain what is a cardiac defibrillator? Describe the different types of cardiac pacemakers used in medical fields. (8)
- b) With a block diagram explain the working of a hemo-dialysis machine. (7)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) How X-rays are produced? What are its properties? Mention any three applications of X-rays in medicine. (8)
- b) What is the basic principle of Computed Tomography (CT)? How image reconstruction is done in CT. (8)
- c) Mention four major applications of CT. (4)
- 8 a) What is the principle of Ultrasonic imaging and describe the imaging modalities of Ultrasonic imaging system? (8)
- b) Compare A-mode, B-mode and M-mode displays in Ultrasonic imaging system. (6)
- c) Describe the image acquisition and reconstruction techniques in Magnetic Resonance Imaging (MRI). (6)
- 9 a) What are the basic components of telemetry system? Describe single channel telemetry system for ECG and temperature. (9)
- b) Mention any three major applications of telemetry in medicine. (3)
- c) What are the sources of electrical hazards? Explain about the precautions to be observed to prevent electric shock hazards. (8)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: HS300**

**Course Name: PRINCIPLES OF MANAGEMENT**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any three full questions, each carries 10 marks.*

- |   |  | Marks |
|---|--|-------|
| 1 | a) Define management.  | (3)   |
|   | b) Why management is called an art and science?  | (3)   |
|   | c) In the context of a car manufacturing firm, describe any four elements of the external environment. | (4)   |
| 2 | a) What is meant by competitive advantage?   | (2)   |
|   | b) List any four important features of the organizations of the new era.                               | (4)   |
|   | c) What challenges are faced by the new generation firms?  | (4)   |
| 3 | a) List any four important contributions by FW Taylor.   | (4)   |
|   | b) Why Elton Mayo's studies is called human relations management?                                      | (2)   |
|   | c) State Douglas Mc Gregor's Theory X and Theory Y   | (4)   |
| 4 | a) Distinguish between system approach and contingency approach.                                       | (4)   |
|   | b) Draw 7S Framework.  | (3)   |
|   | c) Describe any one instance of application of Corporate Social Responsibility.                        | (3)   |

**PART B**

*Answer any three full questions, each carries 10 marks.*

- |   |   |     |
|---|---|-----|
| 5 | a) List any four objectives of planning                                     | (4) |
|   | b) Who require strategic planning? Why?                                     | (3) |
|   | c) Distinguish between plan, goal and procedure.                            | (3) |
| 6 | a) List the steps of the planning process adopted in a production firm.     | (4) |
|   | b) Why the planning of lower level managers is considered easier?           | (3) |
|   | c) List the advantages of Management by objectives.                         | (3) |
| 7 | a) Define span of control.  | (2) |
|   | b) Classify the factors affecting the span of control.                      | (5) |
|   | c) What is meant by departmentation?  | (3) |
| 8 | a) List the merits and demerits of line organization structure (three each) | (6) |
|   | b) Why decision making is a difficult task? (four reasons)                  | (2) |
|   | c) List any two methods to deal with decision making under uncertainty.     | (2) |

**PART C**

*Answer any four full questions, each carries 10 marks.*

- |   |   |     |
|---|---|-----|
| 9 | a) Write a note on staffing function of management.         | (3) |
|   | b) Give three reasons for the delegation of authority.      | (3) |
|   | c) List out the important characteristics of entrepreneurs. | (4) |

- 10 a) What is meant by –“Centralization of authority” (3)  
b) List the steps of selecting engineers in a production firm. (5)  
c) List four important interpersonal skills to be possessed by a manager. (2)
- 11 a) Explain the need of Job Design, indicating the factors influencing it. (4)  
b) What is meant by a culture responsive organisation? (3)  
c) List three important characteristics of global type organisation. (3)
- 12 a) How does a leader differ from a manager? (4)  
b) Explain trait approach to leadership and contingency approach. (6)
- 13 a) Describe any two type of leadership styles. (4)  
b) List six important qualities of a leader. (6)
- 14 a) Explain the process of controlling function with the aid of a sketch. (5)  
b) Distinguish between feed back and feed forward control mechanisms. (5)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: EC307**

**Course Name: POWER ELECTRONICS & INSTRUMENTATION (EC)**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 15 marks.*

- |   |   | Marks |
|---|---|-------|
| 1 | a) Explain in details the static characteristics of Power BJT. Compare the I-V characteristics of Power BJT with low signal BJT.  | (8)   |
|   | b) What is meant by a boost converter? Explain using relevant circuit diagram and waveforms. Write down the expression for output ripple voltage.   | (7)   |
| 2 | Describe the structure of Power MOSFET by explaining channel formation. Draw its I-V characteristics labelling different voltages as well as regions of operation. Also draw the switching characteristics. | (15)  |
| 3 | a) Describe Forward converter including its circuit, wave forms and expressions.  | (5)   |
|   | b) Explain Push-pull converter including its circuit, wave forms and expressions.   | (5)   |
|   | c) Explain full bridge DC-DC converter with the help of circuit diagram and suitable waveforms.   | (5)   |

**PART B**

*Answer any two full questions, each carries 15 marks.*

- |   |   |      |
|---|---|------|
| 4 | a) What is the general arrangement of an online UPS system? Explain with the help of block diagram.       | (5)  |
|   | b) How to measure resistance using Wheatstone's bridge?   | (5)  |
|   | c) With neat block diagram explain functional elements of measuring instruments.                          | (5)  |
| 5 | a) Describesingle phase half bridge inverter explaining the principle of sinusoidal PWM switching scheme. | (7)  |
|   | b) Explain the concept of space vector modulation?  | (8)  |
| 6 | a) Define the following Static Characteristics:   | (10) |
|   | i) Resolution ii) Precision iii) Repeatability iv) Linearity v) Sensitivity                               |      |
|   | b) How to measure inductance using Maxwell-Wein's Bridge.   | (5)  |

**PART C**

*Answer any two full questions, each carries 20 marks.*

- |   |  |     |
|---|--|-----|
| 7 | a) What is the principle of operation of a resistance transducer? Explain the working of strain gauge. | (8) |
|   | b) Draw and explain the block diagram of Frequency synthesizer.  | (6) |
|   | c) What is RF power meter? Explain its working.  | (6) |
| 8 | a) What is a transducer? Explain the classification of transducers.                                    | (7) |
|   | b) Describe the Construction and working of LVDT with neat schematic.                                  | (8) |
|   | c) Explain the working of a Hall effect transducer.  | (5) |
| 9 | a) Discuss DSO with the help of a block diagram.   | (8) |
|   | b) Draw and explain the block diagram of Spectrum Analyzer.  | (6) |
|   | c) Describe digital voltmeter with neat block diagram.   | (6) |

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: EC305**

**Course Name: MICROPROCESSOR & MICROCONTROLLERS (EC)**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 15 marks.*

- |  | Marks |
|--|-------|
| 1 a) Draw and explain the 8085 architecture.                                       | (10)  |
| b) Define Machine Cycle and Instruction Cycle.                                     | (5)   |
| 2 a) Draw the bit pattern of 8085 flag register.                                   | (5)   |
| b) Explain the block diagram and operation of the 8279 Keyboard/Display interface. | (10)  |
| 3 a) Compare Mode 0, Mode 1 and Mode 2 operations of 8255.                         | (7)   |
| b) Explain the addressing modes of 8085 with example.                              | (8)   |

**PART B**

*Answer any two full questions, each carries 15 marks.*

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|--|------|
| 4 a) What is the function of 8086 instruction queue.   | (4)  |
| b) What is the Difference between a Microprocessor and a Microcontroller?  | (4)  |
| c) Write an Assembly Language Program for 8051 to clear the lower 128 bytes of internal RAM with help of DJNZ instruction.   | (7)  |
| 5 a) With an example illustrate the physical address generation in 8086.   | (5)  |
| b) With the help of a functional block diagram explain the 8051 microcontroller.   | (10) |
| 6 a) Compare the 8086 and 80386 processors.  | (4)  |
| b) Explain the PSW special function register of 8051.  | (4)  |
| c) Fifteen bytes of data are stored from location 6CH of internal RAM of 8051. Write an ALP to count the number of locations which contain data 11H and to store the result to RAM location 6BH. | (7)  |

**PART C**

*Answer any two full questions, each carries 20 marks.*

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|--|------|
| 7 a) What is an interrupt? List the interrupt sources of 8051.   | (5)  |
| b) Explain the SFRs TMOD and TCON.   | (5)  |
| c) Draw a block diagram to interface a stepper motor to 8051 with a step angle of 1.8 degrees. Also write an ALP to run the motor alternatively in Slow and High speeds in clock wise direction. | (10) |
| 8 a) What is the difference between a Timer and Counter?   | (5)  |
| b) Write notes on serial communication of 8051.  | (5)  |
| c) Draw the schematic of DAC interface to 8051. Develop an ALP to generate square waves of 2 KHz frequency with 50 percent duty cycle using a DAC.   | (10) |
| 9 a) What is meant by vectored interrupts?   | (4)  |
| b) An 8051 microcontroller is interfaced with 12 MHz crystal. Develop an ALP to generate a delay of 2 seconds.   | (8)  |
| c) Draw the schematic to connect an LED to the P1.0 and develop a program to blink the LED continuously.   | (8)  |

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**FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: EC303**

**Course Name: APPLIED ELECTROMAGNETIC THEORY (EC)**

Max. Marks: 100

Duration: 3 Hours

*Smith Chart to be supplied on request.*

**PART A**

*Answer any two full questions, each carries 15 marks.*

- 1 a) Derive the expressions for Energy stored in Electric Field. (8)
- b) Eight identical charges,  $Q$  each are placed on the corners of a cube of side 'a'. Find the resultant force on a charge. (7)
- 2 a) Derive Maxwell's first and second equations from fundamental laws. (8)
- b) Starting from Maxwell equation, derive the wave equation for a conducting medium. (7)
- 3 a) Determine the inductance of a Two-wire transmission line. (5)
- b) A Parallel plate capacitor with plate area of  $5\text{cm}^2$  and a plate separation of 3mm has a voltage  $50\sin 10^3 t$  Volt applied to its plates. Calculate the displacement current assuming  $\epsilon = 2\epsilon_0$ . (4)
- c) Derive the boundary conditions for electric field at the interface of two dielectrics. (6)

**PART B**

*Answer any two full questions, each carries 15 marks.*

- 4 a) State Poynting theorem. Derive the equation of complex vector. (8)
- b) A lossless  $50\text{-}\Omega$  transmission line is terminated in a load with  $Z_L = (50 + j25)\ \Omega$ . Calculate (i) The reflection coefficient  $\Gamma$ . (ii) The standing-wave ratio. (7)
- 5 a) Derive the input impedance of a transmission line. For a shorted section of 75 ohm transmission line,  $l = \lambda/4$ , Find the input impedance assuming  $\alpha = 0$ . (7)
- b) Differentiate circular and elliptical polarization. (8)
- 6 a) Derive standard Transmission line equations. (8)
- b) Derive Brewster angle. A parallel-polarized plane wave is incident from air onto a dielectric medium with  $\epsilon_r = 9$  at the Brewster angle. What is the refraction angle? (9)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) A lossless transmission line with  $Z_0 = 50\ \Omega$  is 30m long and operates at 2MHz. The line is terminated with a load  $Z_L = 60 + j40\ \Omega$ . If  $u = 0.6c$  on the line, find (15)
  - i) Reflection coefficient
  - ii) Standing wave ratio
  - iii) Input impedance
- b) Discuss the attenuation of waveguides. (5)
- 8 a) Explain single stub matching in detail using analytical method. (12)
- b) Explain Group velocity and Phase velocity. When a wave of 6GHz propagates in parallel conducting plates separated by 3cm, find the  $V_P$  and  $V_g$  of the wave for dominant wave. (8)
- 9 a) Explain waveguides and its different modes of wave propagation. (10)
- b) Explain Half Wave and Quarter Wave Transmission lines. Given that  $Z_L = 30 + j40\ \Omega$ ,  $Z_0 = 50\ \Omega$ . Find the shortest length ('l') and point where stub has to be placed for a matching. (Use Smith chart) (10)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**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) Explain, how DFT and IDFT can be expressed as Linear Transformation   | (3)  |
|   | b) Derive the relationship of DFT to Z-transform   | (3)  |
|   | c) Find the circular convolution of $x[n] = \{1, 2, -1, 3, 4\}$ and $h[n] = \{2, -1, 4, 1, 3\}$  | (5)  |
|   | d) Explain overlap add method for filtering of long data sequences.  | (4)  |
| 2 | a) Show that, if $x[n]$ is a real and even sequence, then its DFT $X[k]$ is also real and even   | (3)  |
|   | b) Find linear convolution of $x[n] = \{2, 3, -1\}$ and $h[n] = \{1, -1, 2\}$ , using circular convolution.  | (5)  |
|   | c) Find the number of complex multiplications involved in the calculation of a 1024 point DFT using (i) direct computation(ii) radix-2 FFT algorithm | (3)  |
|   | d) Explain, how N point DFTs of two real-valued sequences can be found by computing a single N point DFT.  | (4)  |
| 3 | a) Find 8 point DFT of $x[n] = \{2, 1, -1, 3, 5, 2, 4, 1\}$ using radix-2 decimation in time FFT algorithm   | (11) |
|   | b) Explain, how a 2N point DFT of a 2N point real-valued sequence can be found by computing a single N point DFT.                                    | (4)  |

**PART B**

*Answer any two full questions, each carries 15 marks.*

- |   |   |      |
|---|---|------|
| 4 | a) Prove that, if $z_1$ is a zero of a linear phase FIR filter, then $1/z_1$ is also a zero.  | (5)  |
|   | b) Design a linear phase FIR low pass filter having length $M = 15$ and cut-off frequency $\omega_c = \pi/6$ . Use Hamming window.  | (10) |
| 5 | a) Explain the design of linear phase FIR filters by the frequency sampling method.   | (9)  |
|   | b) Explain the frequency transformations in the analog domain   | (6)  |
| 6 | Design a digital Butterworth low pass filter with $\omega_p = \pi/6$ , $\omega_s = \pi/4$ , minimum pass band gain = -2dB and minimum stop band attenuation = 8dB. Use bilinear | (15) |

transformation. (Take  $T = 1$ )

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) Find the lattice structure implementation of FIR filter  $h[n] = \{1, 0.5, 0.75, -0.6\}$  (6)
- b) Draw the direct form II structure and transposed direct form II structure of (5)
- $$H(z) = \frac{1+0.5z^{-1}-0.75z^{-2}}{1+0.6z^{-1}+0.4z^{-2}-0.2z^{-3}}$$
- c) Draw the block diagram of TMS320C67XX and briefly explain the function of each block. (9)
- 8 a) Draw the direct form realization of linear phase FIR filter (5)
- $h[n] = \{1, 0.5, 0.25, -0.5, 0.8, -0.5, 0.25, 0.5, 1\}$  using minimum multipliers.
- b) Draw the signal flow graphs of direct form II and cascade form structures (5)
- of  $H(z) = \frac{(0.8+0.2z^{-1}+0.6z^{-2})(1-0.6z^{-1})}{(1-0.6z^{-1}+0.8z^{-2})(1+0.8z^{-1}-0.7z^{-2})}$
- c) Explain the effects of coefficient quantization in IIR and FIR filters. (10)
- 9 a) Give the output of decimation by M system in time domain. Explain output frequency spectrum. What is the importance of low pass filtering prior to down-sampling? (10)
- b) How does a floating-point number represented in a processor? Explain the operations of addition and multiplication of two floating point numbers with examples. (5)
- c) Derive the variance of quantization noise in ADC with step size  $\Delta$ . (Assume quantization noise has uniform distributed pdf with zero mean) (5)

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