

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EE401
Course Name: ELECTRONIC COMMUNICATION

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 5 marks.*

Marks

- | | | |
|---|--|-----|
| 1 | Explain the advantages of FM over AM. | (5) |
| 2 | What are the factors to be considered in selecting Intermediate Frequency? | (5) |
| 3 | Explain the features of interlaced scanning. | (5) |
| 4 | Illustrate PWM and state the merits and demerits. | (5) |
| 5 | Give comparison between TDMA and FDMA | (5) |
| 6 | Explain CDMA referred to satellite communication. | (5) |
| 7 | Explain the major components in a fibre optic communication link with the help of block diagram. | (5) |
| 8 | Explain the concept of frequency reuse. | (5) |

PART B*Answer any two full questions, each carries 10 marks.*

- | | | |
|----|--|------|
| 9 | a) Calculate the percentage power saving for the SSB signal if the AM wave is modulated to a depth of (a) 100% and (b) 50% | (4) |
| | b) With the help of block diagram, explain filter method for the generation of SSB AM. | (6) |
| 10 | a) Describe the frequency spectra of SSB and VSB signals. | (4) |
| | b) With neat circuit diagram, explain the operation of Balanced slope detector | (6) |
| 11 | a) Draw the block diagram of a super heterodyne AM receiver. Describe its operation stating the primary functions of each stage. | (10) |

PART C*Answer any two full questions, each carries 10 marks.*

- | | | |
|----|---|-----|
| 12 | a) Draw the block diagram of a pulsed radar system. Explain the functions of each block. | (5) |
| | b) Explain with the help of a neat sketch, the working of a TV picture tube. | (5) |
| 13 | a) Calculate the maximum range of a radar system which operates at 3cm, with a peak pulse power of 500 kW, if its minimum receivable power is 10^{-13} W, the | (4) |

capture area of its antenna is 5m^2 and the radar cross sectional area of target is 20m^2 .

- b) Explain the schematic for PAM generation process using flat top sampling. (6)
- 14 a) Explain the block schematic for PCM generation process. (6)
- b) Explain the principles of differential PCM system? (4)

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Explain the block diagram of an earth station used for satellite communication. (6)
- b) What are the advantages of optical fibre communication? (4)
- 16 a) Explain any two detectors used in optical fibre communication. (6)
- b) Explain the networking capability of Zig-Bee? (4)
- 17 a) Identify any three features of Bluetooth and explain how does it benefit for wireless applications? (5)
- b) Explain cell splitting technique. (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: EE401
Course Name: Electronic Communication

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

Marks

- | | | |
|---|--|-----|
| 1 | With the help of block diagram, explain the working of balanced modulator. | (5) |
| 2 | Draw the block diagram of super heterodyne receiver and explain the function of mixer stage. | (5) |
| 3 | Explain the block diagram of a colour television transmitter | (5) |
| 4 | Differentiate between PPM and PWM with sketches. | (5) |
| 5 | Explain the significance of TDMA for satellite communication? | (5) |
| 6 | Explain the role of earth station in the satellite communication systems? | (5) |
| 7 | With a block schematic explain the operation of GPS. | (5) |
| 8 | Explain how cell splitting improves the capacity. | (5) |

PART B

Answer any two full questions, each carries 10 marks.

- | | | |
|----|--|-----|
| 9 | a) A modulating signal $v_m(t) = 5 \sin(6280 t)$ is used to modulate a carrier signal $v_c(t) = 15 \sin(62800 t)$. Determine the modulation index, side band frequencies, amplitudes and bandwidth. Also draw the frequency spectrum. | (5) |
| | b) When do you prefer VSB signals to SSB. Why? | (5) |
| 10 | a) With a neat schematic explain the function of each block in FM transmitter using Armstrong Modulator. | (6) |
| | b) Explain following parameters of Radio receiver: i) adjacent channel selectivity and ii) image frequency rejection. | (4) |
| 11 | a) Draw typical AGC circuit for a super heterodyne receiver and explain its working. | (5) |
| | b) Explain the working principle of a FET reactance modulator for FM generation. | (5) |

PART C

Answer any two full questions, each carries 10 marks.

- | | | |
|----|--|-----|
| 12 | a) Derive the basic radar equation, as governed by the minimum receivable echo power P_{min} . | (5) |
|----|--|-----|

- b) Differentiate between interlaced scanning and progressive scanning. (5)
- 13 a) Draw and explain the block diagram of an HDTV system. (5)
- b) Explain the block diagram of monochrome TV receiver. (5)
- 14 a) State the significance of Nyquist rate in sampling process. (4)
- b) Explain the role of encoder and decoder in PCM. (6)

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Differentiate between FDMA and CDMA? (4)
- b) Write notes on step index and graded index fibres. (6)
- 16 a) Explain the schematic diagram of a WiFi cellular architecture. (4)
- b) What is co-channel interference and how is it reduced? (6)
- 17 a) Explain the features of any photodiode as an optic light detectors. (5)
- b) Draw and explain the schematic diagram of a typical optical fibre link. (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: EE401
Course Name: Electronic Communication

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

Marks

1. Obtain the expression for amplitude modulated wave. (5)
2. Draw and explain the basic block diagram of FM receiver. (5)
3. Explain the need of blanking pulses in the scanning process of television system. (5)
4. Explain with sketch, the principle of Pulse Amplitude Modulation (5)
5. Compare the basic principles of TDMA and FDMA. (5)
6. Explain the principle of any two Photo-detection methods in optical fiber communication. (5)
7. Explain the working of GPS system. (5)
8. Explain the term cell sectoring in cellular telephone system. (5)

PART B

Answer any two full questions, each carries 10 marks.

9. a) Explain vestigial side band modulation. Mention its advantages. (5)
b) Show that the maximum transmitting power of an AM signal is 1.5 times the carrier power. (5)
10. a) Explain the phase shift method for the generation of SSB AM. (5)
b) Explain the significance of modulation index in frequency modulation. (5)
11. a) Explain the working of Foster Seeley discriminator with circuit diagram and relevant vector diagrams. (10)

PART C

Answer any two full questions, each carries 10 marks.

12. a) Explain the basic performance factors of RADAR and derive the radar range equation. (10)
13. a) Draw and explain the block diagram of cable TV. (5)
b) With schematic, explain the concept of pulse position modulation. (5)

14. a) Explain the process involved in pulse code modulation. (10)

PART D

Answer any two full questions, each carries 10 marks.

15. a) With block diagram, explain the encoding and decoding process in CDMA technique applicable to satellite communication. (10)
16. a) Explain the block diagram of fibre optical link. (5)
b) Explain the Bluetooth based communication systems. (5)
17. a) Describe any two call processing methods in a cellular telephone system. (5)
b) Explain the various interferences associated with cellular communication. (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech S7 (S) Exam Sept 2020

Course Code: EE401**Course Name: Electronic Communication**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 5 marks.*

Marks

1. Define AM and derive the equation for AM wave. (5)
2. Explain with a neat sketch, the working of super heterodyne receiver. (5)
3. Draw and explain the block diagram of HDTV transmitter or receiver. (5)
4. Write short note on natural sampling and flat top sampling process in digital communication. (5)
5. Explain different types of optical fibre. (5)
6. Draw and explain the block diagram of earth station. (5)
7. Explain the architecture of Zigbee system. (5)
8. Explain with schematic, the architecture of Bluetooth. (5)

PART B*Answer any two full questions, each carries 10 marks.*

9. a) With the help of a block diagram, explain "phase shift method" of SSB generation. Show mathematically how one of the sideband is cancelled in this method. (10)
10. a) Compare and contrast between SSB and VSB. (5)
b) Explain the operation of balanced slope detector. (5)
11. a) Explain the generation of FM using Armstrong method with suitable block diagram. (10)

PART C*Answer any two full questions, each carries 10 marks.*

12. a) Explain the block diagram of monochrome TV receiver. (10)
13. a) Derive the radar range equation and mention factors affecting range of a radar. (5)
b) Explain with diagram, different pulse modulation techniques. (5)
14. a) With neat sketches, explain the complete system of transmission and reception of pulse code modulation. (6)
b) Differentiate between PAM, PWM and PPM (4)

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Explain CDMA satellite system with block diagram. (10)
- 16 a) With block diagram, explain the working of an optical fibre communication system (5)
- b) Differentiate between Wi-fi and Wi-max. (5)
- 17 a) Explain different techniques to improve the capacity in cellular system. (10)

Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EE403

Course Name: DISTRIBUTED GENERATION AND SMART GRIDS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

		Marks
1	Compare smart grid with conventional utility grid.	(5)
2	Explain how the real and reactive powers are controlled in a power electronic inverter based energy source.	(5)
3	What is a smart meter, used in smart grid? List the features.	(5)
4	List any five key features of smart energy efficient end use devices.	(5)
5	Write short note on the design considerations of Sensor and Actuator Networks (SANET).	(5)
6	Describe the characteristics of AMI?	(5)
7	Write short notes on Distortion Index (DIN).	(5)
8	How Cloud computing is useful in a smart grid?	(5)

PART B

Answer any two full questions, each carries 10 marks.

9	Draw and explain the typical configuration of an AC microgrid.	(10)
10	With the help of block diagrams, explain the classification and working of micro turbines.	(10)
11	a) Explain the components of an Ultra capacitor. Mention its advantages and disadvantages.	(5)
	b) Explain the working flywheel energy storage (FES) system.	5

PART C

Answer any two full questions, each carries 10 marks.

12	Draw and explain the National Institute of Standards and Technology (NIST) Smart grid reference architecture. Explain its various domains.	10
13	a) What do you mean by islanding of microgrid? List the different islanding scenarios in microgrid.	5

- b) What is load shaping? What are the advantages? 5
- 14 A power station has the following daily load cycle 10

Time(Hr)	0-5	5-11	11-13	13-16	16-22	22-24
Load(MW)	15	25	40	30	35	25

Draw the load curve and determine (i) Maximum demand (ii) Total energy units generated per day (iii) Average load (iv) Load factor

PART D

Answer any two full questions, each carries 10 marks.

- 15 What is Feeder Automation? List and explain the different components of Feeder Automation. 10
- 16 a) Explain with neat sketches the basic architecture of smart substation. 7
- b) Enumerate various advantages of smart substation 3
- 17 List and explain various power quality issues with smart grids. 10

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: EE403

Course Name: DISTRIBUTED GENERATION AND SMART GRIDS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

Marks

- | | | |
|---|---|-----|
| 1 | What is an active distribution network? Explain its relevancy in microgrid system. | (5) |
| 2 | Explain the operation of a lead acid battery and mention its merits and demerits. | (5) |
| 3 | Draw the block diagram of an Automated Meter Reading(AMR) system and write the functions of each block. | (5) |
| 4 | Define Energy management. What is the significance of energy management? | (5) |
| 5 | Explain briefly the benefits AMI? | (5) |
| 6 | What are the different advantages of smart substations over conventional substations? | (5) |
| 7 | What are the various types of clouds? | (5) |
| 8 | List the various power quality disturbances in the grid. | (5) |

PART B

Answer any two full questions, each carries 10 marks.

- | | | |
|----|---|------|
| 9 | Draw and explain the typical configuration of a DC microgrid. | (10) |
| 10 | a) Explain the role of central controller in stand-alone and grid connected mode of operation of microgrids. | (5) |
| | b) Explain the control functions of micro-resource controller (MC). | (5) |
| 11 | Explain the working and operation of different Wind Energy Conversion Systems. Also mention the advantages and disadvantages. | (10) |

PART C

Answer any two full questions, each carries 10 marks.

- | | | |
|----|--|---|
| 12 | a) Draw the block diagram and explain the working of Phasor Measurement Unit(PMU). | 5 |
| | b) What is a smart sensor? Using block diagram, explain the different components | 5 |

of a smart sensor.

- 13 Explain different scenarios related to the islanding of microgrid? 10
- 14 a) A power station has a maximum demand of 35MW, a plant capacity factor of 50%, a plant use factor of 70% and load factor of 60%. Determine (i) Reserve capacity (ii) Daily energy produced (iii) Maximum energy that can be produced daily if the plant runs as per the schedule. 7
- b) Justify the statement 'Greater the diversity factor, the lesser is the cost of generation of power'. 3

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Explain the application of SANET in Smart Grid 5
- b) List the SANET actors and explain the requirements of these for different Smart Grid applications. 5
- 16 List and explain the various harmonic sources in grid. 10
- 17 a) Explain cloud computing infrastructure. 5
- b) Explain with neat sketch cloud computing architecture 5

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Seventh semester B.Tech degree examinations (S), September 2020

Course Code: EE403

Course Name: DISTRIBUTED GENERATION AND SMART GRIDS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

Marks

- | | | |
|---|---|-----|
| 1 | Discuss the technical and economical advantages of microgrid. | (5) |
| 2 | Discuss the working principle and operation of ultra capacitor with necessary diagram. | (5) |
| 3 | Comment on the impact of DG integration on electricity market and distribution system. | (5) |
| 4 | Discuss the significance and characteristics of load curve. | (5) |
| 5 | Discuss the role of Sensor and Actuator Networks (SANETs) in smart grid implementation. | (5) |
| 6 | With a neat block diagram explain the Home Area Network (HAN) and its scope in successful implementation of smart grid. | (5) |
| 7 | Classify cloud computing based on its deployment and service. | (5) |
| 8 | Discuss the various harmonic sources and its effect on power quality. | (5) |

PART B

Answer any two full questions, each carries 10 marks.

- | | | |
|----|---|------|
| 9 | Draw the layout of typical micro grid and explain the components in detail. | (10) |
| 10 | (a) Explain the functions of Central Controller in microgrid. | (5) |
| | (b) Explain how active and reactive power control is performed in Microgrid. | (5) |
| 11 | a) What is distributed generation? Explain how it enhances the performance of utility grid. | (5) |
| | b) Elaborate the concept of load sharing through power-frequency control in microgrid. | (5) |

PART C

Answer any two full questions, each carries 10 marks.

- | | | |
|----|---|------|
| 12 | Give the layout and explain in detail the NIST architecture of smart grid and discuss the role of various domains and actors. | (10) |
|----|---|------|

- 13 Explain the various objectives and methodologies of load shaping with relevant waveforms. (10)
- 14 a) Discuss various electricity tariff schemes employed in utility grid. (5)
- b) Define (i) Maximum demand (ii) Diversity factor (iii) Plant Capacity factor (iv) Load Factor and (v) Utilization factor (5)

PART D

Answer any two full questions, each carries 10 marks.

- 15 Explain the key components and architecture of smart substation. (10)
- 16 Explain with suitable diagram (i) Private (ii) Public and (iii) Hybrid cloud computing (10)
- 17 (a) Explain various components of Feeder Automation. (5)
- (b) Elaborate the characteristics of Cloud Computing. (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EE405

Course Name: ELECTRICAL SYSTEM DESIGN

Max. Marks: 100

Duration: 3 Hours

PART A

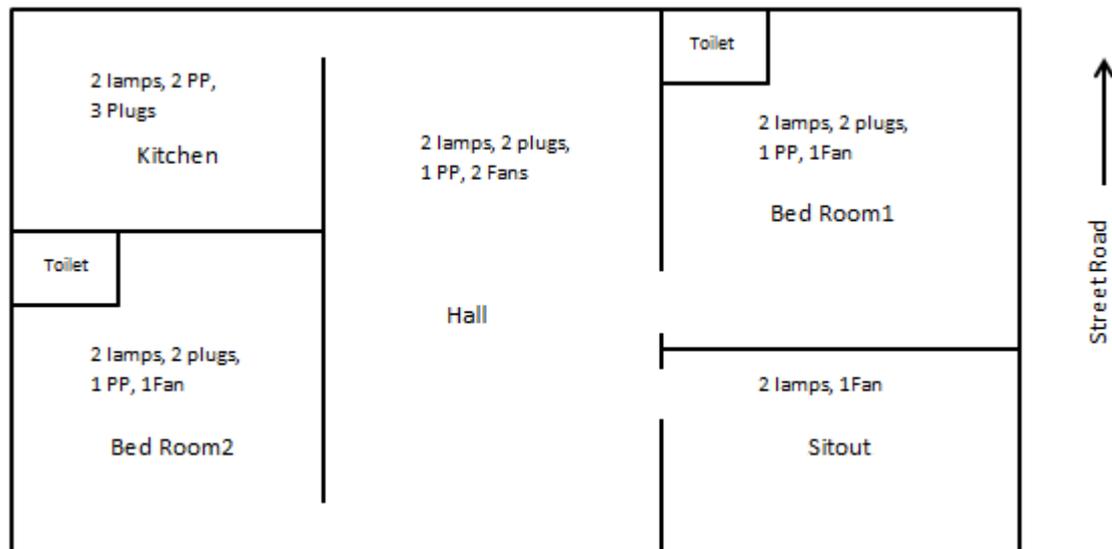
Answer all questions, each carries 5 marks.

	Marks
1	Mention the Scope of Indian electricity act 2003 in brief. (5)
2	Specify a circuit breaker having both short circuit and overload protection. Explain its difference between MCB and ELCB. (5)
3	What are the factors which decide the power distribution architecture in an electrical installation of an industry? (5)
4	List out different types of transformer tests carried out before commissioning. (5)
5	A certain incandescent lamp, hangs from the ceiling of a room. The illuminance received on a small horizontal screen lying on a bench 2m vertically below the lamp is 63.5 lux. Calculate illuminance at a point when the screen is moved horizontally a distance of 1.5m along the bench. (5)
6	Mention the various types of luminaries used for proper lighting scheme. (5)
7	What are the various energy conservation techniques imposed in buildings? (5)
8	Define the function of AMF panel in electrical supply system (5)

PART B

Answer any two full questions, each carries 10 marks.

9	a) What are the steps to be followed for safety precautions against electric shock? (4)
	b) Describe electric service in buildings. (6)
10	a) What are different protective devices used in domestic installation? Explain each one in detail. (6)
	b) Describe the selection procedure for ELCB for domestic and industrial dwelling. (4)
11	Design an electrical schematic for the residential building with following details. (10) Locate the positions of meter board, Main Switch board, DB, switch boards.



PART C

Answer any two full questions, each carries 10 marks.

- 12 Draw the single line diagram of a transformer substation of 400 kVA, 11 kV/ 415 V, dry type transformer. Specify the rating of each unit at the primary and secondary side of the transformer with proper justification. (10)
- 13 a) Design a wiring plan for installing a 40HP induction motor in an industry. (6)
 b) How do you select the starter for 40HP Induction motor of 0.8pf, 80% efficiency? Explain. (4)
- 14 a) How do you design an earth mat in substation? Explain its importance. (5)
 b) What are most common test in UG cables? Explain. (5)

PART D

Answer any two full questions, each carries 10 marks.

- 15 An office 30m X 15m is illuminated by twin 40w fluorescent luminaries of lumen output 5600 lumens. The lamps being mounted at a height of 3m from the work plane, the average illumination required is 240lux. Calculate the number of lamps required to be fitted in the office, assuming the CU 0.6 and maintenance factor to be 0.8. Assume the height of ceiling as 4.5m (10)
- 16 a) Explain rising mains and rising buses in high rise buildings. (4)
 b) Explain the various design parameters taken into consideration while designing street lighting and flood lighting. (6)
- 17 Explain with suitable line diagram, how standby generators can include in existing electrical supply system. Assume HT consumer connection. (10)

Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2018

Course Code: EE405
Course Name: Electrical System Design

Max. Marks: 100

Duration: 3 Hours

PART A

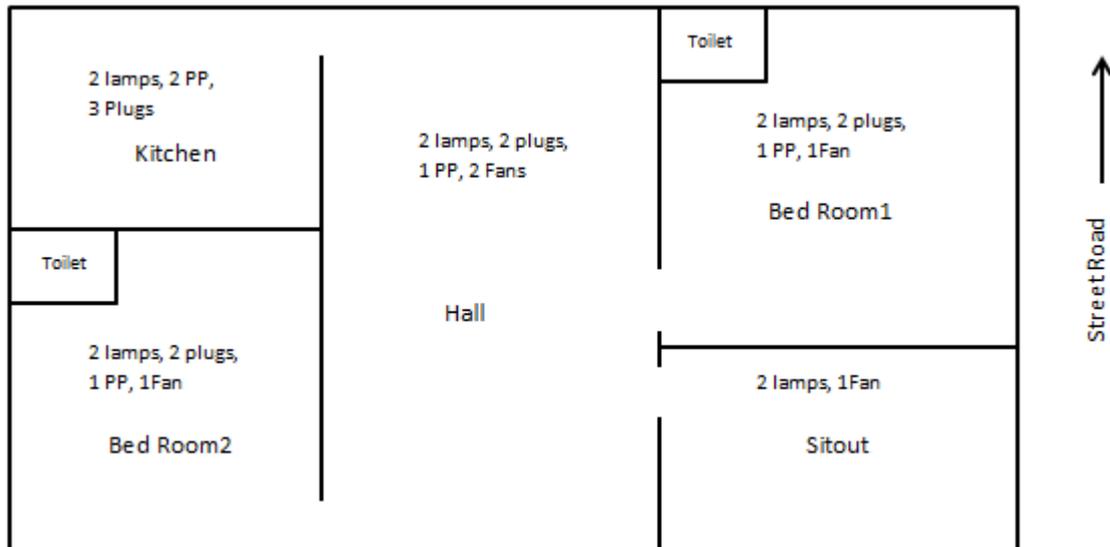
Answer all questions, each carries 5 marks.

		Marks
1	Why it is necessary to have pre-commissioning tests of electrical installations.	(5)
2	Specify a circuit breaker having both short circuit and overload protection. Explain its difference between MCB and ELCB.	(5)
3	Draw the single line diagram of an indoor substation showing all accessories of the system.	(5)
4	List out different types of transformer tests carried out before commissioning.	(5)
5	A certain incandescent lamp, hangs from the ceiling of a room. The illuminance received on a small horizontal screen lying on a bench 2m vertically below the lamp is 63.5 lux. Calculate illuminance at a point when the screen is moved horizontally a distance of 1.5m along the bench.	(5)
6	Mention the features of good lighting scheme for buildings?	(5)
7	What are the various energy conservation techniques imposed in buildings?	(5)
8	Briefly explain need of a solar PV system for domestic application.	(5)

PART B

Answer any two full questions, each carries 10 marks.

9	a) What are the steps to be followed for safety precautions against electric shock?	(4)
	b) Describe electric service in buildings.	(6)
10	a) What are different protective devices used in domestic installation? Explain each one in detail.	(6)
	b) Describe the selection procedure for ELCB for domestic and industrial dwelling.	(4)
11	Design an electrical schematic for the residential building with following details. Locate the positions of meter board, Main Switch board, DB, switch boards.	(10)



PART C

Answer any two full questions, each carries 10 marks.

- 12 a) What are the advantages and disadvantages of an outdoor type substation over an indoor type substation? (6)
- b) What are the classifications of the substations according to its functions? (4)
- 13 a) Design a wiring plan for installing a 75HP induction motor in an industry. (6)
- b) How do you select the starter for the above Induction motor of 0.8pf, 75% efficiency? Explain. (4)
- 14 a) How do you design an earth mat in substation? Explain its importance. (5)
- b) What are most common test in UG cables? Explain. (5)

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) What is energy conservation techniques imposed in buildings? Mention its necessity. (5)
- b) Distinguish between continuous power, prime power and standby power related with standby generator. (5)
- 16 a) Explain rising mains and rising buses in high rise buildings. (4)
- b) Explain the various design parameters taken into consideration while designing street lighting and flood lighting. (6)
- 17 a) Explain with suitable line diagram, how standby generators can include in existing electrical supply system. Assume HT consumer connection. (6)
- b) Write short notes on generator installation and its protection. (4)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: EE405
Course Name: Electrical System Design

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

Marks

- | | | |
|---|---|-----|
| 1 | What are the importance of IS 3043, IS 732? | (5) |
| 2 | Why it is necessary to have pre-commissioning tests of electrical installations. | (5) |
| 3 | Draw the single line diagram of an indoor substation showing all accessories of the system. | (5) |
| 4 | What is polarity test of a transformer? Why it is important. | (5) |
| 5 | What are the requirements of efficient street lighting? | (5) |
| 6 | Mention the features of good lighting scheme for buildings? | (5) |
| 7 | What are the factors to be considered while selecting a standby generator? | (5) |
| 8 | Briefly explain need of a solar PV system for domestic application. | (5) |

PART B

Answer any two full questions, each carries 10 marks.

- | | | |
|----|--|------|
| 9 | a) What are the safety aspects that have to be considered while doing electrical dwelling in LV and MV installations? | (6) |
| | b) What is NEC? Explain its relevance in electrical installations. | (4) |
| 10 | In a residential building, having 45 nos of light points , 10 fan points, 20 nos of 5 ampere plug socket, 6 nos of 15 ampere power plug socket and 1.5 HP single phase motor pump set (assume DOL starting). Calculate the total connected load, the no. of sub-circuits required, and select the conductors used for each sub-circuits. | (10) |
| 11 | A three occupant building has to be electrified independently from a common energy meter. Design the distribution boards with accessories for each resident having 10nos of light circuits, 6 nos of power circuits. | (10) |

PART C

Answer any two full questions, each carries 10 marks.

- | | | |
|----|--|-----|
| 12 | a) What are the advantages and disadvantages of an outdoor type substation over an indoor type substation? | (6) |
| | b) What are the classifications of the substations according to its functions? | (4) |
| 13 | a) What is the difference between LT and HT Motor? Explain with example. | (4) |
| | b) Calculate the load current and cable size of 20HP motor of 415V, 50Hz, supply with 80% efficiency. | (6) |

- 14 a) Draw the single line diagram of pole mounted outdoor substation of 11kV/415V, 250kVA transformer showing all necessary parts based on loading. (7)
- b) What will the full load current for the above scheme? (3)

PART D

Answer any two full questions, each carries 10 marks.

- 15 A shop 16m x 10m is illuminated with 200w incandescent lamps. If a CU of 0.8 and an MF of 0.75 are selected, and an illumination of 260lux is required at the work place, calculate the number of luminaires required. Take the mounting height as 2m. (10)
- 16 a) What is energy conservation techniques imposed in buildings? Mention its necessity. (4)
- b) Distinguish between continuous power, prime power and standby power related with standby generator. (6)
- 17 a) Write short notes on generator installation and its protection. (5)
- b) Explain design requirements of high rise buildings. (5)

Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh semester B.Tech examinations (S), September 2020

Course Code: EE405**Course Name: Electrical System Design**

Max. Marks: 100

Duration: 3 Hours

*(approved data hand book may be permitted inside the examination hall)***PART A***Answer all questions, each carries 5 marks.*

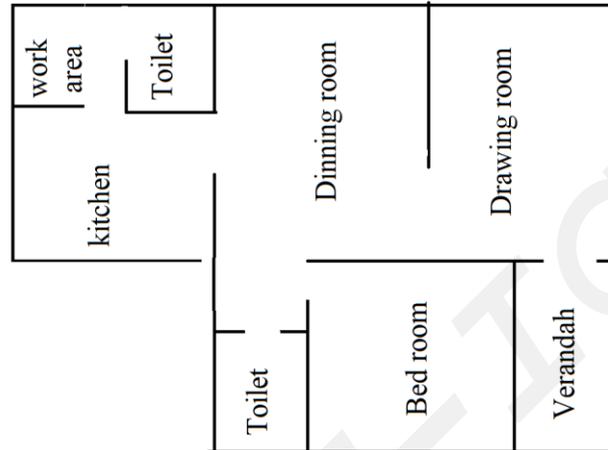
Marks

- | | | |
|---|---|-----|
| 1 | Explain the significance of the Electricity Act 2003. | (5) |
| 2 | How can connected load of an domestic installation be calculated as per NEC guidelines | (5) |
| 3 | Draw the single line diagram of a 250kVA, 11kV/433V indoor substation and justify the component ratings. | (5) |
| 4 | Explain the pre-commissioning tests for cables. | (5) |
| 5 | A lamp giving out 1200 lm in all directions is suspended 8 m above the working plane. Calculate the illumination at a point on the working plane 6 m away from the foot of the lamp | (5) |
| 6 | What are the design considerations of a good lighting scheme | (5) |
| 7 | Distinguish between standby power, continuous power, prime power related with standby generators | (5) |
| 8 | What are the different types of design for PV systems? Explain with the help of neat block diagram. | (5) |

PART B*Answer any two full questions, each carries 10 marks.*

- | | | |
|----|--|-----|
| 9 | a) Describe the scope of National Electric Code 2011 | (5) |
| | b) Describe the selection procedure of main distribution board in domestic installations | (5) |
| 10 | a) What are the safety aspects applicable to low and medium voltage installations in view of National Electric Code 2011 | (5) |
| | b) Discuss the necessity of pre-commissioning tests in an electrical installation. What the different pre-commissioning tests for the electrical installation? | (5) |

- 11 The plan layout of a one bed room domestic building is shown below. Locate (10)
the light, fan, socket points etc., required for the electrification of the building
as per NEC requirements. Calculate (a) Connected load of the building (b)
Maximum demand in kW (c) Type of supply required (d) Number of light and
power circuits (e) Details of the distribution board selected



PART C

Answer any two full questions, each carries 10 marks.

- 12 a) Which are the main factors to be taken into account for the selection of cables, (5)
Explain
- b) Fault current anticipated in a location is 8000A. soil resistivity = 10 Ω -m. Earth (5)
resistance is limited to 1 Ω . Design an earthing system. Fault duration can be
taken as 3seconds. Plate electrode of 1.2m \times 1.2m \times 12.5mm shall be used.
- 13 A 400kVA, 11kV/433V delta-star connected transformer is installed in an (10)
industry. This transformer is connected to 11kV supply through an over-head
line of length 2.5 km. The conductor used is RABBIT with an equilateral
spacing of 900 mm. The percentage reactance of the transformer is 4% and the
full load copper loss of the transformer is 2%. The three-phase short circuit
power at the utility substation is 400MVA. The resistance of the line conductor
is 0.454 Ω /km. Calculate peak short circuit current on the primary and
secondary terminals of the transformer.
- 14 a) Which are the pre-commissioning tests on power transformers used in an (5)
electrical installation. Explain
- b) An outdoor pole mounted 11kV/433 V substation has to be installed for supply (5)
to a residential area having a load of 63 kVA. With the help of a neat diagram,
make a list of materials required.

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) A corridor is lighted by 4 lamps spaced 10 m apart and suspended at a height of 5 m above the centre line of the floor. If each lamp gives 200 candle-power in all directions below the horizontal, find the illumination at the point on the floor mid-way between the second and third lamps. (5)
- b) Explain with the help of block diagram the working of automatic main failure system (5)
- 16 a) What is the significance of LLF in lighting design? Explain its components. (5)
- b) Design the lighting scheme for an area measuring 160m x 80m using high pressure sodium vapour lamps. The design requirements are illumination level = 15 lux, mounting height of pole = 10m, coefficient of utilization = 0.7, light loss factor = 0.75, with two luminaires per pole. Assume a ratio of spacing to mounting height as 4.0 (5)
- 17 What are the design considerations of solar PV system for domestic applications (10)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EE407

Course Name: DIGITAL SIGNAL PROCESSING

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

Marks

- | | | |
|---|--|-----|
| 1 | State any five properties of DFT. | (5) |
| 2 | Explain single stage lattice structure for an FIR filter with neat diagram and equations. | (5) |
| 3 | For the analog transfer function $H(s) = \frac{1}{(s+1)(s+2)}$, determine H(z) using impulse invariance method for T=1 sec. | (5) |
| 4 | What do you understand by linear phase response? Mention the characteristics of linear phase FIR filter. | (5) |
| 5 | What is meant by product quantization error in digital signal processing? | (5) |
| 6 | Define is zero input limit cycle oscillation with an example. | (5) |
| 7 | Define the function of (i) Program Counter (ii) Program Address Register (iii) Stack and (iv) Microstack | (5) |
| 8 | How the instruction set of TMS 320C24x processor is classified? | (5) |

PART B

Answer any two full questions, each carries 10 marks.

- | | | |
|----|--|------|
| 9 | Calculate the 8-point DFT of x[n] using Decimation in Frequency FFT Algorithm. x[n]= {0,1,2,3,4,5,6,7} | (10) |
| 10 | a) Perform the linear convolution of the following sequences using overlap-add method. x(n) = {1, -2, 2, -1, 3, -4, 4, -3} and h(n)={1,-1} | (5) |
| | b) Determine the cascade form realization for the transfer function of an FIR digital filter which is given by | (5) |
| | $H(Z) = \left(1 - \frac{1}{4}Z^{-1} + \frac{3}{8}Z^{-2}\right) \left(1 - \frac{1}{8}Z^{-1} - \frac{1}{2}Z^{-2}\right)$ | |
| 11 | Realize using direct 1 form, direct-2 form and cascade form representation of filter given by transfer function | (10) |

$$H(z) = \frac{8 - 4z^{-1} + 11z^{-2} - 2z^{-3}}{\left(1 - \frac{1}{4}z^{-1}\right)\left(1 - z^{-1} + \frac{1}{2}z^{-2}\right)}$$

PART C

Answer any two full questions, each carries 10 marks.

- 12 Using Bilinear transformation, design a Butterworth filter which uses a sampling rate of 1 kHz, to satisfy following specifications (10)

$$0.8 \leq |H(e^{j\omega})| \leq 1 \text{ for } 0 \leq |\omega| \leq 0.2\pi$$

$$|H(e^{j\omega})| \leq 0.2 \text{ for } |\omega| \geq 0.6\pi$$

- 13 a) Derive the equation for transformation of H(s) to H(z) using impulse invariance method. Discuss about stability of the system after transformation. (5)
- b) Compare Rectangular and hanning window with the help of required equations. (5)
- 14 Using frequency sampling method, design a band pass filter with following specifications. (10)

Sampling frequency $f=10$ kHz, Cut-off frequencies $f_{c1} = 2000$ kHz and $f_{c2} = 4000$ kHz. Take $N=7$.

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) In the given IIR system, the products are rounded to 4 bits including sign bit. (7)

$$H(z) = \frac{1}{(1 - 0.35z^{-1})(1 - 0.62z^{-1})}$$

Find the output round off noise power in direct form realization.

- b) Compare the fixed point and floating point arithmetic. (3)
- 16 a) What are the methods used to prevent overflow in digital filter implementations? (5)
- b) Define any five I/O instructions used in TMS320C24x (5)
- 17 What are the addressing modes in TMS 320C24x processor? Describe with examples. (10)

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Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: EE407

Course Name: DIGITAL SIGNAL PROCESSING

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

Marks

- | | | |
|---|--|-----|
| 1 | What is the need of zero padding? Obtain linear convolution of the sequence $x(n)=\{1,2,3\}$, $h(n)=\{-1,-2\}$ using circular convolution. | (5) |
| 2 | Realize the system function using minimum number of multipliers
$H(z) = (1 + Z^{-1})(1 + \frac{1}{2}Z^{-1} + \frac{1}{2}Z^{-2} + Z^{-3})$ | (5) |
| 3 | For the analog transfer function $H(s) = \frac{10}{(s^2+7s+10)}$, determine $H(z)$ using impulse invariant method for $T=0.2$ sec | (5) |
| 4 | Compare Hamming and Barlett windows with required equations. | (5) |
| 5 | Express the fraction $7/8$ and $-7/8$ in sign magnitude, 1's complement and 2's complement. | (5) |
| 6 | What is zero input limit cycle oscillation? | (5) |
| 7 | What are the different buses of TMS 320 C24x processor and their functions? | (5) |
| 8 | Define any 5 arithmetic and logic instructions in TMS 320 C24x processor. | (5) |

PART B

Answer any two full questions, each carries 10 marks.

- | | | |
|----|--|------------|
| 9 | Determine the 8-point DFT of the following sequence.
$x(n)=\{0.5, 0.5, 0.5, 0.5, 0, 0, 0, 0\}$. Using radix-2 decimation in time FFT algorithm. | (10) |
| 10 | a) Perform the linear convolution of the following sequence by Overlap save method. $x(n)=\{1,2,3,-1,-2,-3,4,5,6\}$ and $h(n)=\{2,1,-1\}$
b) Obtain direct form II realization of a system described by,
$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + \frac{1}{2}x(n-1)$ | (5)
(5) |
| 11 | Obtain the cascade and parallel realizations for the system function | (10) |

$$H(Z) = \frac{1 + \frac{1}{4}Z^{-1}}{\left(1 + \frac{1}{2}Z^{-1}\right)\left(1 + \frac{1}{2}Z^{-1} + \frac{1}{4}Z^{-2}\right)}$$

PART C

Answer any two full questions, each carries 10 marks.

- 12 Design a digital Butterworth filter satisfying the constraints: (10)
- $$0.9 \leq |H(e^{jw})| \leq 1 \quad \text{for } 0 \leq w \leq \pi/2$$
- $$|H(e^{jw})| \leq 0.2 \quad \text{for } 3\pi/4 \leq w \leq \pi,$$
- with T=1 sec using bilinear transformation.

- 13 a) Write down the transfer function H(s) of a 2nd order Chebyshev low pass filter (6)
with 3 dB cut-off frequency of 1 rad/sec. Determine H(z) by using approximation of derivative method with a sampling interval of 1 sec.
- b) Compare IIR and FIR filters. (4)
- 14 Design a high pass filter with a frequency response (10)
- $$H(e^{jw}) = 1, \quad \frac{\pi}{6} \leq |w| \leq \pi$$
- $$= 0, \quad \text{otherwise}$$
- using Hanning window. Take N=7

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Draw the product quantization noise model of a second order IIR system. (5)
- b) Two first order filters are connected in cascade whose system functions of the (5)
individual sections are $H_1(z) = 1/(1 - 0.5z^{-1})$ and $H_2(z) = 1/(1 - 0.6z^{-1})$.
Determine overall output noise power.
- 16 a) Obtain the limit cycle behaviour of the system described by (5)
 $y(n) = Q[ay(n-1)] + x(n)$, where $y(n)$ is the output of the filter and $Q[.]$ is the
rounded operation. Assume $a = \frac{7}{8}$, $x(0) = \frac{3}{4}$ & $x = 0$, for $n > 0$ choose 4 bit
sign magnitude.
- b) What are the functions of TREG and PREG in TMS 320 C24x processor? (5)
- 17 Draw and describe the functional block diagram of TMS 320 C24x processor. (10)

Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: EE407

Course Name: DIGITAL SIGNAL PROCESSING

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

Marks

- | | | |
|---|--|-----|
| 1 | The first five points of the 8 point DFT of a real valued sequence are $\{28, -4 + 9.565j, -4 + 4j, -4 + 1.656j, -4\}$. Determine the remaining three points. | (5) |
| 2 | Explain transposed structure with an example. | (5) |
| 3 | Describe warping effect with a diagram. | (5) |
| 4 | What is the principle of designing FIR filter using frequency sampling method. | (5) |
| 5 | What is meant by rounding? Explain its effect on all types of number representations. | (5) |
| 6 | Express 0.875 and -0.875 in sign-magnitude, two's complement, and one's complement format. | (5) |
| 7 | With a block diagram, describe Central Arithmetic Logic Unit in TMS 320 C24x in detail. | (5) |
| 8 | How instruction set is classified in TMS 320 C24x processor? | (5) |

PART B

Answer any two full questions, each carries 10 marks.

- | | | |
|----|---|------|
| 9 | Find IDFT of the sequence $X(k) = \{4, 1 - 2.414j, 0, 1 - 0.414j, 0, 1 + 0.414j, 0, 1 + 2.414j\}$ using radix 2 DIF FFT algorithm. | (10) |
| 10 | a) Consider the sequence $x_1(n) = \{0, 1, 2, 3, 4\}$, $x_2(n) = \{0, 1, 0, 0, 0\}$. Determine a sequence $y(n)$ so that $Y(K) = X_1(K) X_2(K)$ | (5) |
| | b) Realise the given Transfer function with minimum number of multipliers. | (5) |
| | $H(Z) = 1 + \frac{1}{3}Z^{-1} + \frac{1}{4}Z^{-2} + \frac{1}{4}Z^{-3} + \frac{1}{3}Z^{-4} + Z^{-5}$ | |
| 11 | Obtain direct form II, cascade form and parallel form realization of the LTI system governed by | (10) |

$$y(n) = \frac{-3}{8} y(n-1) + \frac{3}{32} y(n-2) + \frac{1}{64} y(n-3) + x(n) + 3x(n-1) + 2x(n-2)$$

PART C

Answer any two full questions, each carries 10 marks.

- 12 Design a low pass Butterworth digital filter to give attenuation of 3dB or less for frequencies up to 2kHz and attenuation of 20dB or more beyond 4kHz. Use bilinear transformation and obtain H(z) of the desired filter. Given sampling interval T=0.1 millisecond. (10)
- 13 a) Write down the transfer function H(s) of a 3rd order Chebyshev low pass filter and cut-off frequency of 1 rad/sec. Determine H(z) by using approximation of derivative method with a sampling interval of 1 sec. (7)
- b) What is the need for windowing technique for FIR filter design? (3)
- 14 Design a bandpass filter to pass the frequency in the range 1-2 rad/samples using Hamming window. Also find frequency response of the filter. Take N=5. (10)

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Obtain the limit cycle behaviour of the system described by $y(n) = Q[ay(n-1)] + x(n)$, where $y(n)$ is the output of the filter and $Q[.]$ is the rounded operation. Assume $a = -\frac{1}{2}$, $x(0) = 0.875$ & $x = 0$, for $n > 0$ choose 4 bit including sign bit. (6)
- b) Draw the product quantization noise model of IIR system with two first order sections in cascade. (4)
- 16 a) The output of an ADC is applied to a digital filter with system function $H(z) = \frac{0.5z}{(z-0.5)}$. Find the output noise power from digital filter when input signal is quantized to have 8 bits. (5)
- b) Define any 5 branching instructions in TMS 320 C24x processor. (5)
- 17 Draw the internal architecture of Central Processing Unit of TMS 320 C24x processor and define each block. (10)

Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MARCH 2020

Course Code: EE407

Course Name: DIGITAL SIGNAL PROCESSING

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

Marks

- | | | |
|---|---|-----|
| 1 | How circular and linear convolutions are performed using DFT? | (5) |
| 2 | State and explain flow graph reversal theorem | (5) |
| 3 | What do you mean by frequency warping? An ideal discrete time high pass filter with cut off frequency $\pi/2$ was designed using bilinear transformation with $T=1$ sec. What is the cut off frequency of the continuous time ideal high pass filter? | (5) |
| 4 | What is a linear phase filter? What conditions are to be satisfied by an FIR filter in order to have linear phase? | (5) |
| 5 | What is the effect of quantization of filter coefficients in digital filters? | (5) |
| 6 | What do you mean by dead band of a filter? How will you compute the dead band of the system $y(n) = 0.8y(n - 1) + x(n)$? | (5) |
| 7 | What are the elements in the control unit of TMS 320 C24x DSP Processor? | (5) |
| 8 | Which are the TREG, PREG and Multiply Instructions of TMS 320 C24x DSP Processor? | (5) |

PART B

Answer any two full questions, each carries 10 marks.

- | | | |
|----|---|------|
| 9 | Given $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$, Compute 8-point DFT of $x(n)$ using DIT FFT algorithm | (10) |
| 10 | a) Find the output $y(n)$ of a filter whose impulse response is $h(n) = \{2, 2\}$ and the input signal to the filter is $x(n) = \{-2, 0, 2, 1, 3, 1, -1, -2\}$ using overlap-save method | (5) |
| | b) Realize the system function $H(z) = 1 + \frac{3}{4}z^{-1} + \frac{17}{8}z^{-2} + \frac{3}{4}z^{-3} + z^{-4}$ using minimum number of multipliers. | (5) |
| 11 | Consider the discrete time, linear, causal system described by the difference equation $y(n) - \frac{3}{4}y(n - 1) + \frac{1}{8}y(n - 2) = x(n) + \frac{1}{3}x(n - 1)$. Obtain the direct form I and Direct form II realizations of the system | (10) |

PART C

Answer any two full questions, each carries 10 marks.

- 12 Design a digital Butterworth filter using bilinear transformation which satisfies (10)
the following conditions:

$$0.75 \leq |H(e^{j\omega})| \leq 1, \quad 0 \leq \omega \leq 0.2\pi$$

$$|H(e^{j\omega})| \leq 0.2, \quad 0.5\pi \leq \omega \leq \pi$$

Take sampling time T=1 sec

- 13 a) Can we physically realise an ideal filter? Justify your answer (2)
b) What is impulse invariant transformation? What are its disadvantages? (3)
c) Which are the desirable characteristics of windows? (2)
d) What is Gibb's phenomenon? (3)
- 14 Design an ideal low pass filter, whose desired frequency response given by (10)

$$H_d(e^{j\omega}) = \begin{cases} 1 & \text{for } -\pi/3 \leq \omega \leq \pi/3 \\ 0 & \text{for } \pi/3 \leq |\omega| < \pi \end{cases}$$

Determine the filter coefficients, using Hanning window. Determine the impulse response and H(z). Given N=9.

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Draw the quantization noise model of the first order system function (6)
 $H(z) = \frac{1}{1 - 0.4z^{-1}}$. Products are rounded to 4 bits including sign bit. Find the
steady state noise power due to product round off.
b) Explain signal scaling in digital filters. (4)
- 16 a) What are the possible errors due to truncation, in sign magnitude and two's (5)
complement representations if the system uses b+1 bits including sign bit for the
number representation?
b) Explain the bus structure of TMS 320 C24x DSP Processor (5)
- 17 a) Explain in detail indirect addressing mode of TMS 320 C24x DSP Processor (5)
with examples
b) Discuss about any five Accumulator, arithmetic, and logic instructions of TMS (5)
320 C24x DSP Processor with examples

Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh semester B.Tech examinations (S), September 2020

Course Code: EE407**Course Name: DIGITAL SIGNAL PROCESSING**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 5 marks.*

Marks

- 1 What is the necessity of computing Fast Fourier Transform? Calculate the number of multiplication needed in the calculation of DFT using FFT algorithm with 32 point sequence. (5)
- 2 Check whether the following transfer function is of linear phase. Justify your answer. $H(z) = \left(\frac{1}{2} + z^{-1} + \frac{1}{2}z^{-2}\right)\left(1 + \frac{1}{3}z^{-1} + z^{-2}\right)$ (5)
- 3 How s-plane is mapped to z-plane using impulse invariant transformation? Comment on the stability of the filter after this transformation. (5)
- 4 What do you mean by Gibbs phenomenon in connection with FIR filter design. How its effect can be reduced? (5)
- 5 Explain product quantization error and obtain the quantization noise model for a second order system. (5)
- 6 What is truncation? What is the error caused due to truncation of a number to b bits? (5)
- 7 What are the memory and I/O spaces used in TMS320C24x processor? (5)
- 8 Explain (i) Interrupt flag register (ii) Microstack (iii) Scaling shifters (5)

PART B*Answer any two full questions, each carries 10 marks.*

- 9 Given $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$, find $X(K)$ using DIF FFT algorithm. (10)
- 10 a) How will you compute linear convolution using DFTs? (5)
- b) Realize the following system function using minimum number of multipliers: (5)

$$H(z) = \left(1 + \frac{1}{2}z^{-1} + z^{-2}\right)\left(1 + \frac{1}{4}z^{-1} + z^{-2}\right)$$

(10)

- 11 Obtain the direct form II and cascade realization of

$$y(n) = x(n) + 2x(n-1) + \frac{1}{2}y(n-1) - \frac{1}{2}y(n-2)$$

PART C

Answer any two full questions, each carries 10 marks.

- 12 (a) Find the order of an analog Butterworth filter that has a -2dB passband attenuation at a frequency of 20rad/sec and atleast -10dB stopband attenuation at 30rad/sec (5)
- (b) With the help of neat diagrams, explain frequency warping. How it can be eliminated? (5)
- 13 a) For the analog transfer function $H(s) = \frac{2}{(s+2)(s+3)}$, determine $H(z)$ using bilinear transformation method for $T=1$ sec. (5)
- b) The desired frequency response of a lowpass filter is given below. (5)

$$H_d(\omega) = \begin{cases} e^{-j3\omega} & \text{for } -\frac{\pi}{4} \leq \omega \leq \frac{\pi}{4} \\ 0 & \text{for } \frac{\pi}{4} \leq |\omega| \leq \pi \end{cases}$$

. Obtain the filter coefficients $h(n)$ by using a rectangular window.

- 14 Using frequency sampling method design an FIR lowpass filter with $\omega_c = \frac{\pi}{4}$ rad/sec for $N=15$. (10)

PART D

Answer any two full questions, each carries 10 marks.

- 15 Find the effect of coefficient quantization on pole locations of the given IIR system when it is realised in cascade form. Assume a word length of 3 bits excluding sign bit. (10)

$$H(z) = \frac{1}{1 - 0.8z^{-1} + 0.15z^{-2}}$$

- 16 a) Check whether limit cycle exists for the following first order IIR filter with difference equation $y(n) = x(n) + Q[ay(n-1)]$ if $a = -\frac{1}{3}$ and the input $x(n) = 0.875, n = 0$ and $x(n) = 0, n \neq 0$ and $y(-1) = 0$. The data register length is 4 bits including sign bit. $Q[.]$ represents rounding operation. (5)
- b) How the instruction sets of TMS320C24x processor are classified? (5)
- 17 With a functional block diagram, explain the main architectural features of TMS320C24x processor. (10)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EE409

Course Name: ELECTRICAL MACHINE DESIGN

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

		Marks
1	List five types of enclosures used in electrical machines.	(5)
2	Derive the output equation of a single phase core type transformer.	(5)
3	Define specific magnetic loading? Explain the factors need to be considered for choice of specific magnetic loading in a dc machine	(5)
4	Write short notes on (i) Short circuit ratio (ii) Run away speed.	(5)
5	How do you separate 'D' and 'L' from the volume D^2L of a 3 phase induction motor?	(5)
6	Explain the rules for selecting number of rotor slots in a three phase induction motor.	(5)
7	What is meant by discretization in finite element method?	(5)
8	Explain the hybrid techniques available for computer aided design.	(5)

PART B

Answer any two full questions, each carries 10 marks.

9	a) Examine the different types of ventilations in electrical machines.	(4)
	b) Derive the gap contraction factor for slots.	(6)
10	Determine the dimensions of core and yoke for a 100KVA 50Hz single phase core type transformer. A square core is used with distance between the adjacent limbs equal to 1.6 times the width of laminations. Assume Emf/turn 14V, Maximum flux density 1.1 Wb/m^2 , current density 3 A/mm^2 , window space factor 0.32, stacking factor 0.9. Flux density in the yoke to be 80% of flux density in the core.	(10)
11	a) Explain the procedure to calculate MMF for air gap and teeth in an electrical machine.	(5)
	b) Derive the volt per turn equation of a single phase transformer.	(5)

PART C

Answer any two full questions, each carries 10 marks.

12	a) Explain in steps how to separate D and L for a DC machine?	(3)
	b) Find out the main dimensions of a 50kW, 4 pole, 600 rpm DC shunt generator to give a square pole face. The full load terminal voltage being 220 V. The maximum gap density is 0.83 Wb/m^2 and the ampere conductors per meter is 30000. Assume that full load armature voltage drop is 3 per cent of rated terminal voltage and that the field current is 1 per cent of rated full load	(7)

- current. Ratio of pole arc to pole pitch is 0.67.
- 13 a) Distinguish between cylindrical pole and salient pole construction. (3)
b) Determine the main dimensions of a 2500 kVA 187.5 rpm, 50Hz 3 phase 3 kV, salient pole synchronous generator. The generator is to be a vertical, water wheel type. The specific magnetic loading is 0.6 wb/mm^2 and the specific electric loading is 34000 A/m . Use circular poles with ratio of core length to pole pitch = 0.65. Specify the type of pole construction used if the run away speed is about 2 times the normal speed. (7)
- 14 a) Explain the design procedure of interpoles in DC machines? (5)
b) Determine the main dimensions of a 500 kVA, 50Hz 3 phase alternator to run at 375 rpm. The average air gap flux density is 0.55 wb/mm^2 , the specific electric loading is 25000 A/m . The peripheral speed should not exceed 35 m/sec . (5)

PART D

Answer any two full questions, each carries 10 marks.

- 15 (a) With all details of the various parameters including the units derive the output equation of a 3 phase squirrel cage induction motor. (5)
(b) Design the main dimensions of a 25 kW, 3 phase, 415V, 50 Hz, 1475 rpm squirrel cage induction motor having an efficiency of 85 % and full load power factor of 0.86. Assume $B_{av} = 0.5 \text{ T}$, $a_c = 28000 \text{ A/m}$. The rotor peripheral velocity is 25 m/s at synchronous speed. (5)
- 16 a) Explain how finite element method is used for analysis of electrical machines. (6)
b) List out the advantages of FEM based methods over conventional design procedures. (4)
- 17 a) Explain the procedure for separation of D and L from D^2L product while designing induction motors. (5)
b) What is computer aided design? How does it help in designing electrical machines? (5)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: EE409

Course Name: Electrical Machine Design

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

Marks

- | | | |
|---|---|-----|
| 1 | What is meant by hot spot rating in electrical machines? | (5) |
| 2 | Compare the reluctance of slotted armature with that of smooth armature surface. | (5) |
| 3 | Derive the output equation of DC machine. | (5) |
| 4 | Explain different types of cooling systems used in synchronous machines. | (5) |
| 5 | List out and explain the factors to be considered for selection of specific electric loading in 3-phase induction motors. | (5) |
| 6 | State the main constructional differences between cage induction motor and slip ring induction motor. | (5) |
| 7 | Explain synthesis method for computer aided design of electrical machines | (5) |
| 8 | Explain on few softwares used for designing electrical machines? | (5) |

PART B

Answer any two full questions, each carries 10 marks.

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|----|---|-----|
| 9 | a) Examine any four components of armature leakage flux. | (4) |
| | b) Derive the relation between real and apparent flux densities. | (6) |
| 10 | a) Derive the output equation for 3 phase core type transformer. | (4) |
| | b) Determine the dimensions of core and yoke for a 200KVA 50Hz single phase core type transformer. A cruciform core is used with distance between adjacent limbs equal to 1.6 times width of core laminations. Assume voltage per turn 14 V, maximum flux density 1.1 Wb/m^2 , window space factor 0.32, current density 3 A/mm^2 and stacking factor 0.9. The net iron area is $0.56d^2$ in a cruciform core where d is the diameter of circumscribing circle and width of largest stamping is $0.85d$. | (6) |
| 11 | a) Explain unbalanced magnetic pull in rotating electrical machines. | (5) |
| | b) Derive the ratio of gross core area to area of circumscribing circle for a square core of a transformer. | (5) |

PART C

Answer any two full questions, each carries 10 marks.

- 12 a) Explain the flux pulsation produced in dc machine. (5)
b) Explain step by step design procedure of brushes and commutator in a DC machine. (5)
- 13 Find the main dimensions of a 100 MVA, 11kV, 50 Hz, 150 rpm, 3 phase water wheel generator. The average gap density is 0.65 Wb/m^2 and the ampere conductors per meter is 40000. The peripheral speed should not exceed 65m/s at normal running speed in order to limit the run away peripheral speed. Assume the winding factor to be 0.955. (10)
- 14 a) Explain step by step design procedure for armature of a dc machine. (5)
b) Find the main dimensions of a 2500 kVA, 187.5 rpm, 50 Hz, 3 phase, 3 kV, salient pole synchronous generator. The generator is to be vertical, water wheel type. The specific electric loading is 34000 A/m and B_{av} is 0.6 Wb/m^2 . Use circular poles with ratio of core length to pole pitch to be 0.65. Specify the type of pole construction used if the run-away speed is about 2 times the normal speed. (5)

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) How do the iron losses affect selection of B_{av} ? (5)
b) Explain cogging and crawling in 3-phase induction machines. (5)
- 16 a) Explain on Analysis method of solving electrical machine using CAD with a flow chart. (6)
b) What are the advantages of analysis method? (4)
- 17 a) Design the main dimensions of a 25 kW, 3 phase, 415V, 50 Hz, 1475 rpm squirrel cage induction motor having an efficiency of 85 % and full load power factor of 0.86. Assume $B_{av} = 0.5T$, $a_c = 28000 \text{ A/m}$. The rotor peripheral velocity is 25 m/s at synchronous speed. (5)
b) Explain the steps involved in the computer aided design and analysis of electrical machines. (5)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: EE409

Course Name: Electrical Machine Design

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

Marks

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| 1 | Briefly explain the different types of enclosures used in electrical machines. | (5) |
| 2 | Give two differences between power transformer and distribution transformer. | (5) |
| 3 | Explain in steps the design of series field winding for a DC machine. | (5) |
| 4 | Salient pole alternators are not suitable for high speeds. Why? | (5) |
| 5 | State and explain the factors considered for selection of air gap length in induction motors. | (5) |
| 6 | List and justify the advantages of a larger air gap in induction motor. | (5) |
| 7 | List out and explain the features of three finite element based softwares for analysis of electrical machines. | (5) |
| 8 | Explain the basic concept of computer aided design. | (5) |

PART B

Answer any two full questions, each carries 10 marks.

- | | | |
|----|---|------|
| 9 | Explain the procedure to calculate MMF for air gap and teeth in an electrical machine. | (10) |
| 10 | a) Write the design equations to find the area of cross section of conductor for both primary and secondary of a transformer. (3) | (3) |
| | b) Determine the dimensions of core and window for a 5kVA, 50Hz, single phase core type transformer. A rectangular core is used with long side twice as long as short side. The window height is three times the width. Volt per turn is 1.8V, window space factor is 0.2, current density is 1.8A/mm ² and maximum flux density is 1Wb/m ² . (7) | (7) |
| 11 | a) A 15kW 230V 4 pole dc machine has the following data. (7) | (7) |
| | Armature diameter 0.25m, armature core length 0.125m, length of air gap at pole centre 2.5mm, flux per pole 11.7 mWb, Ratio of pole arc to pole pitch 0.66. Calculate the mmf required for air gap if (i) armature surface is treated as smooth (ii) armature is slotted and the gap contraction factor is 1.18. | |

- b) Examine the factors that influence the choice of flux density of a transformer. (3)

PART C

Answer any two full questions, each carries 10 marks.

- 12 a) Differentiate between square pole face and rectangular pole face. (3)
- b) A 4 pole 25hp, 500 V, 600 rpm DC series motor has an efficiency of 82%. The pole faces are square and the ratio of pole arc to pole pitch is 0.67, $B_{av}=0.55$ Wb/m², $a_c=17000$ A/m. Obtain the main dimensions, number of slots, and conductors per slot. Assume it to be wave winding. (7)
- 13 a) List the factors to be considered for the choice of specific electric loading in synchronous machines. (4)
- b) A 3 phase 1800 kVA, 3.3 kV, 50 Hz, 250 rpm, salient pole alternator has the following design data. (i) Stator bore diameter = 230 cm (ii) Gross length of stator bore = 38 cm, (iii) Number of stator slots = 216, (iv) Number of conductors per slot = 4 (v) Sectional area of stator conductor = 86 mm², Using the above data, calculate (i) Flux per pole (ii) Flux density in the air gap (iii) Current density (iv) Size of stator slot. (6)
- 14 a) What are the advantages and disadvantages of higher number of poles in dc machine? (5)
- b) Explain any 3 methods of cooling for turbo alternators. (5)

PART D

Answer any two full questions, each carries 10 marks.

- 15 Estimate the stator core dimensions, number of stator slots and number of stator conductors per slot for a 100 kW, 3300 V, 50 Hz, 12 pole, star connected slip ring induction motor. Assume, Average gap density=0.4 Wb/m², ampere conductors per metre = 25,000 A/m, Efficiency = 90%, Power factor = 0.9 and winding factor = 0.96. Choose main dimensions to give best power factor. The slot loading should not exceed 500 Ampere conductors. (10)
- 16 a) Explain on synthesis method of solving electrical machine using CAD with a flow chart. (7)
- b) What are the advantages of hybrid methods? (3)
- 17 a) Explain how finite element method is used for analysis of electrical machines. (5)
- b) Derive from first principles, the output equation of a 3-phase induction motor. Explain each term used. (5)

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh semester B.Tech examinations (S), September 2020

Course Code: EE409**Course Name: Electrical Machine Design**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 5 marks.*

Marks

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|---|---|-----|
| 1 | Establish a relation between apparent flux density and real flux density for the armature teeth of a DC machine. | (5) |
| 2 | What are the advantages of square core over rectangular core of a transformer? | (5) |
| 3 | Explain why a stationary armature and revolving field type of construction is most convenient for a synchronous generator. | (5) |
| 4 | What are the important points to be considered while selecting the type of winding in dc machine? | (5) |
| 5 | What are the guiding factors that decide the selection of ampere conductors per metre of an induction machine? | (5) |
| 6 | Derive output equation of induction machine. | (5) |
| 7 | What are the salient points of analysis methods of design of machine? Draw the flow chart corresponding to analysis method. | (5) |
| 8 | What are the hybrid techniques available for computer aided design? | (5) |

PART B*Answer any two full questions, each carries 10 marks.*

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|----|---|------|
| 9 | a) What do you understand by continuous, short time and short time intermittent ratings of an electrical machine? | (5) |
| | b) What is carter's coefficient and how does it help in estimation of mmf of slotted armature? | (5) |
| 10 | a) What are the practical aspects of unbalanced magnetic pull that must be considered while designing electrical machines? | (5) |
| | b) Derive the output equation of a three-phase transformer. | (5) |
| 11 | Calculate the approximate overall dimensions for a 200 kVA, 6600/440 V, 50 Hz, 3 phase core type transformer. The following data may be assumed: emf per turn = 10 V, maximum flux density = 1.3 Wb/m ² , current density = 2.5 A/mm ² , window space factor = 0.3, overall height = overall width, stacking factor = 0.9. Use a 3 stepped core. For a 3 stepped core: Width of largest stamping = 0.9d and net iron area = 0.6d ² where d is the diameter of the circumscribing circle. | (10) |

PART C

Answer any two full questions, each carries 10 marks.

- 12 a) What is meant by specific electric and specific magnetic loading in a dc machine? From first principles, obtain the expressions for specific magnetic loading and specific electric loading. (5)
- b) A 350KW, 500V, 450 rpm, 6 pole dc generator is to be built with an armature diameter of 0.87m and core length of 0.32 m. The lap wound armature has 660 conductors. Calculate the specific electric and specific magnetic loadings. (5)
- 13 A 500KW, 460V, 8 pole, 375 rpm compound generator has an armature diameter of 1.1m and core length of 0.33m. Design a symmetrical armature winding. The armature ampere conductors/metre are 34000. The internal voltage drop is 4% of terminal voltage and field current is 1% of output current. The ratio of pole arc to pole pitch is 0.7. The voltage between adjacent segments at no load should not exceed 15V and the slot loading should not exceed 1500 amps. The diameter of the commutator is 0.65 of armature diameter and minimum allowable pitch of segment is 4mm. Make suitable assumptions. (10)
- 14 a) Derive the output equation of a synchronous generator (4)
- b) Find the main dimensions of a 2500 KVA, 187.5 rpm, 50 Hz 3 phase 3 KV salient pole synchronous generator. The generator is to be a vertical water wheel type. The specific magnetic loading is 0.6 Wb/m^2 . The specific electric loading is 34000 Amp/m. Use circular poles with ratio of core length to pole pitch is 0.65. Specify the type of pole construction used. The runaway speed is about 2 times the normal speed. (6)

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Explain the procedure for design of rotor bars and slots in a squirrel cage induction motor. (5)
- b) Describe the salient features of computer aided design of electrical machines. What are the advantages of computer aided design? (5)
- 16 a) Derive an expression for the end ring current of a squirrel cage induction motor. (5)
- b) Explain how FEM is used for the analysis of electrical machines. (5)
- 17 A 15KW, 440V, 4 poles, 50Hz, 3 Phase induction motor is built with a stator bore 0.25m and core length of 0.16m. The specific loading is 23000 Amp conductors/m. Using the data of this machine; determine the core dimensions, no. of stator slots and number of stator conductors for a 11 KW, 460V, 6 pole, 50Hz motor. Assume a full load efficiency of 84% and power factor of 0.82 for each machine. The winding factor is 0.955. (10)
