ADAMAS UNIVERSITY
END-SEMESTER EXAMINATION: JULY 2020

Name of the Program: B. Tech
Stream: CSE/ECE/EE
PAPER TITLE: Digital Electronics
Maximum Marks: 40
Total No of questions: 08

Semester: IV

PAPER CODE: EEC42102
Time duration: 3 hours
Total No of Pages: 02

Instruction for the Candidate:

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

Answer all the Groups

Group A

Answer all the questions of the following **5×1 = 5**

1. a) Convert $A0F9.0EB_{16}$ to decimal.

b) Reduce the following Boolean expression: $AB + \overline{AC} + A\overline{B}C(AB + C)$

c) Differentiate Combinational and Sequential Circuit.

d) Show how the J-K flip flop can be operated as a toggle flip flop.

e) What is the difference between Ring and Johnson Counter?

GROUP –B
(Short Answer Type Questions)

Answer *any three* of the following **3×5 = 15**

2. a) Simplify the following Boolean function using K-Map and realize the simplified expression using logic gates. [3]

$$f(A,B,C,D) = \prod_M (1,4,5,11,12,14) \,.\, d(6,7,15)$$

b) Implement the Boolean function using 8:1 multiplexer [2]

$$f(A,B,C,D) = \sum_m (1,3,4,11,12,13,14,15)$$

3. a) Construct a Master slave JK flip flop with truth table and explain the operations. [3]

b) Design a 3:8 line Decoder. [2]

4. Obtain the set of prime implicants for the boolean expression [5]

$$f = \sum_m (1,2,3,5,6,7,8,9,12,1315)$$

5. Implement the following set of Boolean functions with a PLA: [5]

$$F_1(A,B,C) = \sum_m (0,1,2,4)$$

$$F_2(A,B,C) = \sum_m (0,5,6,7)$$

GROUP –C

(**Long Answer Type Questions**)

Answer *any two* of the following **2×10 = 20**

6. a) Design MOD-6 Asynchronous/Ripple Up Counter using JK Flip Flop [4]

b) Write the different conditions to check for determining the type of Decoder, number of AND gates and OR gates for realization of Boolean expression using PLDs. Realize the following set of logical expressions using ROM, PLA and PAL. [6]

$$Y_1 = AC + \bar{A}B$$

$$Y_2 = ABC + AB\bar{C} + \bar{A}BC$$

$$Y_3 = A\bar{B}C + AB\bar{C} + A\bar{B}\bar{C}$$

7. a) Define a Register. What is the difference between a Register and a Shift Register? Explain the data movement technique through a Parallel-In Serial Out Shift Register. [1+2+2]

b) How does a JK flip flop differ from an SR flip flop in its operation? What is its advantage over an SR flip flop? [3+2]

8. a) Design 2-bit Magnitude Comparator Circuit. [4]

b) Explain the operation of master slave J-K flip flop and show how the race around condition is eliminated in it. [6]

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END-SEMESTER EXAMINATION: JULY 2020

Name of the Program: B.Tech. **SEMESTER-IV**
Stream: ECE/EE
PAPER NAME: Analog Communication **PAPER CODE: EEC42104**

Maximum Marks: 40 **Time: 3 Hours**

Total No of questions:08 **Total No of Pages: 02**

Instruction for the Candidate:

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Answer all the Groups

Group A

Answer all the questions of the following

$5 \times 1 = 5$

1.

(a) Calculate the upper side band power of a modulated carrier of 1 KWatt and modulated to 30%.

(b) What is the theoretical band width of a WBFM signal?

(c) Derive the Noise figure of a standard DSB-SC receiver,

(d) Write down the PSD of white noise.

(a) A signal $x(t) = 100cos24\pi \times 10^3 t$ is ideally sampled with a sampling period of 50 μs and then passed through an ideal lowpass filter with cutoff frequency of 15kHz. Which of the following frequency is/are present at the filter output?

Group – B

(Short Answer Type Questions)

Answer ***any three*** of the following.

$3 \times 5 = 15$

2. Discuss about the roles of pre-emphasis and de-emphasis circuit in FM broadcasting. [5]
3. What is slope detector? What are the problems of slope detectors and how is it overcome using a balanced slope detector? [2+3]
4. Derive the expression of signal to noise ratio of DSB-SC system. [5]
5. Compare VSB and SSB schemes of amplitude modulation. [5]

Group – C

(Long Answer Type Questions)

Answer ***any two*** of the following

$2 \times 10 = 20$

6. a) With the help of a block diagram describe the indirect (Armstrong) method of generating FM signal.

b) In an Armstrong-type FM generator the Crystal oscillator frequency is 200 KHz. The maximum phase deviation is limited to 0.2 to avoid distortion. Let the modulating frequency f_m range from 50 Hz to 15 KHz. The carrier frequency at the output is 108 MHz and the maximum frequency deviation is 75KHz. Select the multiplier and mixer oscillator frequencies.

c) Explain the working principle of PLL for FM demodulation. [3+3+4]

7. a) Explain how the use of an RF amplifier improves the SNR of a Superheterodyne receiver.

b) What are the functions fulfilled by the IF amplifier in a radio receiver?

c) List and discuss the factors influencing the choice of the intermediate frequency for a radio receiver.

d) Consider a superheterodyne receiver designed to receive frequency band 1MHz to 30MHz with an IF of 40MHz. What is the range of frequencies generated by the local oscillator for this receiver? An incoming signal with frequency 10MHz is received at the 10MHz setting. At this setting of the receiver we also get an interference from some other signal. What is the carrier frequency of the interfering signal? [2+2+2+4]

8. a) Discus the methods for modulation of PAM signal.

b) Compare PAM with PWM and PPM system of signal transmission.

c) Discuss the generation of PPM using 555 timer. [3+2+5]

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END-SEMESTER EXAMINATION: JULY 2020

Name of the Program: B. Tech
Stream: ECE
PAPER TITLE: Digital Signal Processing
Maximum Marks: 40
Total No of questions: 08

Semester: IV

PAPER CODE: EEC42106
Time duration: 3 Hours
Total No of Pages: 02

Instruction to the Candidate:
1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

Answer all the Groups

Group A

Answer all the questions of the following $5 \times 1 = 5$

1.

a) A system with an input and output is described by a relation: y(n) = x(8n), determine whether the system is Linear or Non-linear and time invariant or time variant.

b) Calculate the energy of unit step function, u (n)

c) Calculate the Nyquist sampling rate of the signal $x(t) = 6\sin(8\Pi t) + \cos(20\Pi t)$

d) If the signal $x(n) = 3^n u(n)$, then find the Z-transform of x(-n)

e) If DTFT of $x(n)$ is $X(\omega)$. Then, compute DTFT of $x(n-k)$

GROUP –B

(Short Answer Type Questions)

Answer *any three* of the following $3 \times 5 = 15$

2.

a) Define FIR system

b) Consider a FIR filter with system transfer function [1+4]

$H(Z) = 1 + 2.5z^{-1} + 3z^{-2} - z^{-4} + 5z^{-5}$

(i) Sketch transposed from of realization corresponding to direct form

(ii) Find input and output relation

3.

a) Define IIR system [1+4=5]

b) Consider a IIR filter with system transfer function

$$H(Z) = \frac{1 + 1.2z^{-1} + 2z^{-2} + 1.8z^{-3} + 0.8z^{-4}}{1 + 2z^{-1} - 1.5z^{-2} - 1.2z^{-3}}$$

(i) Sketch direct form I of realization

(ii) Find input and output relation

4.

a) Find the number of stage in 32 point radix 2 FFT algorithms. [1+4=5]

b) Write the FFT algorithm using divide and conquer approach by storing signal in row-wise and result in column-wise

5. If DFT of $x_1(n)$ and $x_2(n)$ are $X_1(k)$ and $X_2(k)$ respectively, then prove that [5]

$x_1(n) \Theta x_2(n) \overset{DFT}{\leftrightarrow} X_1(k).X_2(k)$

GROUP –C
(**Long Answer Type Questions**)

Answer *any two* of the following $2 \times 10 = 20$

6.

a) What is radix 2 FFT algorithm? [1+4+5=10]

b) Sketch the butterfly structure of 8 point radix 2 FFT algorithm for decimation in frequency.

c) Calculate circular convolution of the following sequences

$x_1(n) = \{1, 2, 3, 4\}$ and $x_2(n) = \{2, 1, 1, 2\}$

7.

a) What is linear phase system? [1+3+6=10]

b) Determine the class (minimum, maximum and mix phase) of the given systems

(i) $H(Z) = 1 - 5z^{-1} + 6z^{-2}$

(ii) $H(Z) = 6 - 5z^{-1} + z^{-2}$

(iii) $H(Z) = 1 - 2.5z^{-1} + z^{-2}$

c) Find the all possible solution of inverse Z transform of $X(Z) = \dfrac{5Z^{-1}}{3 - 7Z^{-1} + 2Z^{-2}}$

8.

a) Define DFT and IDFT [2+4+4=10]

b) Find and draw the frequency spectrum of the following signal

$$x(n) = \begin{cases} 1, & 0 \le n \le L-1 \\ 0, & \text{otherwise} \end{cases}$$

c) Write the short note on Cascade Form of Realization for IIR system

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END-SEMESTER EXAMINATION: JULY 2020

Name of the Program: B. Tech
Stream: ECE
PAPER TITLE: Antenna and Wave Propagation
Maximum Marks: 40
Total No of questions: 08

Semester: IV
PAPER CODE: EEC42108
Time duration: 3 hours
Total No of Pages: 02

Instruction for the Candidate:

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

Answer all the Groups

Group A

Answer all the questions of the following $5 \times 1 = 5$

1. **a)** A given antenna has radiation resistance of 70Ω and loss resistance of 15Ω. Find its directivity if the power gain is 20.
b) A dipole antenna is operating at 500 MHz. Find its effective area. (Given: Directivity= 1.644)
c) The antennas used for ground wave propagation should possess which kind of polarization?
d) What is Cassegrain feed? Explain its need in the parabolic dish antenna with the aid of suitable diagram.
e) Write down the integral form of the Maxwell's equation (in free space) given below (in differential form): $\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$

GROUP –B
(Short Answer Type Questions)
Answer *any three* of the following $3 \times 5 = 15$

2. a) Calculate the quality factor (Q-factor) of an antenna with bandwidth of 500 KHz and cut off frequency of 20 MHz.
b) For a 3-element Yagi-Uda antenna operating at 120 MHz, find the necessary dimensions if the inter element spacing is 0.19λ. [2.5+2.5]

3. Explain Transit time effect in a two wire transmission line. Draw the equivalent circuit of a transmission line and explain the fundamental parameters of the line. [2.5+2.5]

4. a) What is the difference between Broad-side antenna array and End-fire antenna array? Explain with proper diagram.
b) Explain Duct propagation with the aid of suitable diagram. [2.5+2.5]

5. a) Write down the Friis Transmission Formula.
b) A radio link has a 15 W transmitter connected to an antenna of 2.5 m^2 effective aperture at 5 GHz. The receiving antenna has an effective aperture of 0.5 m^2 and is located at 15 Km line of sight distance from the transmitting antenna. Assuming lossless, matched antennas, find the power delivered to the receiver. [1+4]

GROUP –C
(**Long Answer Type Questions**)

Answer *any two* of the following $\mathbf{2 \times 10 = 20}$

6. a) Enumerate the characteristics of D, E, F_1, and F_2 layers of the ionosphere with proper schematic diagrams.
b) Explain the following with the aid of suitable diagrams (a) Virtual Height (b) Critical frequency and (c) Skip Distance. [5+5]

7. a) Explain fringing effect in Microstrip patch antenna with proper figure. What are the different feeding methods of MSA? Explain with proper figure and equivalent circuits.
b) Calculate the BWFN and power gain (G_p) (in dB) of a 2 m parabolic reflector operating at 6 GHz. [6+4]

8. a) What is the need for antenna arrays? Explain in detail. Explain uniform linear arrays with the help of suitable diagram. What are the three vital parameters of uniform arrays?
b) What do you mean by a frequency independent antenna? Explain the design of a Log-periodic antenna and write down the associated equation for scaling factor. [5+5]

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ADAMAS UNIVERSITY
END-SEMESTER EXAMINATION: JULY 2020

Name of the Program: BCA/ BTECH Semester: IV
Stream: CSE/ECE/EE/ME/CE
PAPER TITLE: HSS IV (Economics for Engineers)
PAPER CODE: HEC42180
Maximum Marks: 40 Time duration: 3 Hours
Total No of questions: 12 Total No of Pages: 02

Instruction to the Candidate:
1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
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Section A

(Answer any **FIVE** *of the following questions)* **Marks: 5*2=10**

1. State the Law of Demand.
2. What do you mean by Perfectly Elastic demand?
3. What do you mean by Opportunity Cost?
4. What do you mean by Income effect?
5. Explain two features of Perfectly Competitive market.
6. Why does an investor want to hold a portfolio?

Section B

(Answer any **TWO** *of the following questions)* **Marks: 2*5=10**

7. State and explain the features of Monopolistic Competition.
8. Distinguish between Cardinal and Ordinal utility theory. Mention any two exceptions to the law of demand. (2+3)

9. Suppose due to adequate rainfall, there has been a good harvest for mangoes. How will the equilibrium price and quantity demanded change under the new situation? Explain diagrammatically.

Section C

(Answer any **TWO** *of the following questions)* **Marks: 2*10=20**

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10. Discuss the common characteristics of infrastructure assets.
11. What do you mean by Own Price, Cross Price and Income Elasticity of demand? Explain with examples.
12. Distinguish between Increase in demand and Extension of demand. What do you mean by Giffen goods? (8+2)

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END-SEMESTER EXAMINATION: JULY 2020

Name of the Program: **B. Tech. in CSE/ECE/EE**
PAPER TITLE: **Probability and Statistics**
Maximum Marks: **40**
Total No of questions: **08**

Semester: **IV**
PAPER CODE: **SMA42102**
Time duration: **3 hours**
Total No of Pages: **02**

Instruction for the Candidate:

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Answer all the Groups

Group A

Answer all the questions of the following $\mathbf{5 \times 1 = 5}$

1. **a)** What is the physical significance of variance in probability distribution?
b) What do we mean by Unbiased Estimator in Statistics?
c) What is the sampling distribution of the sample mean, when the sample is drawn from a normal population with known population variance?
d) State Bayes' Theorem.
e) State statistical definition of probability and its limitation.

GROUP –B
(Short Answer Type Questions)

Answer *any three* of the following $\mathbf{3 \times 5 = 15}$

2. Obtain the rank correlation coefficient for the following data:

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

3. Two urns contain respectively 5 white, 7 black balls and 4 white, 2 black balls. One of the urn is selected by toss of a fair con and then 2 balls are drawn without replacement. If both balls drawn are white, what is the probability that the first urn is selected?

4. Let $T_1$and T_2be two statistics with expectations $E(T_1) = \theta_1 + \theta_2$ and $E(T_2) = \theta_1 - \theta_2$. Find unbiased estimators of $\theta_1$and θ_2.

5. If X is normally distributed with mean 12 and s.d. 4, find $P(0 \leq X \leq 12)$. [Given that the area under standard normal curve less than $z = 3$ is 0.9986]

GROUP –C
(**Long Answer Type Questions**)

Answer *any two* of the following $\mathbf{2 \times 10 = 20}$

6. **a)** The reading of voltage (V) and current (A) through a resistance (R) in an experiment are given by the following table:

Voltage	40	40	60	60	80	80	110	110
Current	5.1	4.8	6.2	5.9	0	10.3	13.0	12.7

Using linear regression, predict the value of current when voltage is 100. Also, predict the voltage value when current is 11.

b) Define regression coefficients and its two important properties. **7+3**

7. In a 300 ml soft-drink bottle of a particular brand the contents may vary little bit from bottle to bottle, because the filling machinery is not perfectly precise. Assuming normal distribution of the contents of the bottles about mean μ (true average of the contents of the bottle) and standard deviation of the distribution is 1.1 ml.

a) Obtain 99% confidence interval for μ on the basis of 3 observations (contents in ml.): 297.3, 298.7, and 299.2. What is the marginal error?

b) Let the margin of error is 1, then what should be the required sample size at 99% level of significance? **5+5**

8. **a)** The diameter of a component produced on a semi-automatic machine is known to be distributed normally with a mean of 15 mm and a standard deviation of 0.2 mm. If we pick up a random sample of size 10, what is the probability that the same mean will be between 14.95 and 15.05 mm? [Given that $\Phi(2.5) = 0.9938$].

b) Derive the maximum likelihood estimator for the parameter of the exponential distribution.

5+5