(Please write your Exam Roll No.) Exam Roll No. 06017702722

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] JUNE 2024

Paper Code: BS-202 **Subject: Probability, Statistics & Linear Programming**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questionin all including Q.No1 which is compulsory. Select one question from each unit. Assume missing data if any. (Scientific Calculators are allowed).

Q1. Attempt all Questions:- 3

a) A batch of 25 injection-molded parts contains 5 that have suffered excessive shrinkage. If two parts are selected at random and without replacement, what is the probability that the second part selected is one with excessive shrinkage?

b) State the Central Limit Theorem. 2

c) Find the moment-generating function of a random variable X following an exponential distribution. 3

d) Explain the general procedure for Hypothesis Testing. 2

e) Solve the following LPP graphically. 5

$$Min\ Z = -3x + 2y$$

subject to

$$x + y \leq 5$$

$$4 \geq x \geq 0, 6 \geq y \geq 1$$

UNIT I

Q2. a) Let the random variable X denote the current measured in a thin copper wire in milliamperes. Assume that the range of X is [0, 20 mA], and assume that the probability density function of X is $f(x) = 0.05, 0 \leq x \leq 20$. What is the probability that a measurement of current is between 5 and 10 milliamperes? Also, determine the mean and standard deviation of X. [7+8=15]

b) Customers are used to evaluate preliminary product designs. In the past, 95% of highly successful products received good reviews, 60% of moderately successful products received good reviews, and 10% of poor products received good reviews. In addition, 40% of products have been highly successful, 35% have been moderately successful, and 25% have been poor products.

i. If a new design attains a good review, then what is the probability that it will be a highly successful product?

ii. If a product does not attain a good review, what is the probability that it will be a highly successful product?

Q3. a) A particularly long traffic light on your morning commute is green 20% of the time that you approach it. Assume that each morning represents an independent trial. [7+3+5=15]

i. Over five mornings, what is the probability that the light is green on exactly one day?

ii. Over 20 mornings, what is the probability that the light is green on exactly four days?

iii. Over 20 mornings, what is the probability that the light is green on more than four days?

b) Suppose the current measurements in a strip of wire are assumed to follow a normal distribution with a mean of 10 milliamperes and a variance of 4 (milliamperes)^2. What is the probability that a measurement will exceed 13 milliamperes?

c) Define Erlang Random Variable with its density function. Errors caused by contamination on optical disks occur at the rate of one error every 10^5 bits. Assume the errors follow a Poisson distribution. What is the probability that there are three or more errors within 10^5 bits?

UNIT II

Q4. a) Determine the value of c, and the covariance and correlation for the joint probability density function $f_{XY}(x, y) = c$ over the range $0 < x < 5, y > 0, and\ x - 1 < y < x + 1$. [7+8=15]

b) A sample of the percentage mole conversion of naphthalene to maleic anhydride follows: 4.2, 4.7, 4.7, 5.0, 3.8, 3.6, 3.0, 5.1, 3.1, 3.8, 4.8, 4.0, 5.2, 4.3, 2.8, 2.0, 2.8, 3.3, 4.8, 5.0.

i. Calculate the sample mean.

ii. Calculate the sample variance and standard deviation.

iii. Construct a box plot of the data

Q5. Suppose that, X is a random variable with mean μand variance σ^2. Let $X_1, X_2, \ldots, X_n$ be a random sample of size n from the population represented by X. Show that the sample mean $\bar{X}$ and sample variance S^2 are unbiased estimators of μ and σ^2, respectively [15]

UNIT III

Q6. a) Aircrew escape systems are powered by a solid propellant. The burning rate of this propellant is an important product characteristic. Specifications require that the mean burning rate [7+8=15]

must be 50 centimeters per second. We know that the standard deviation of burning rate is $\sigma = 2$ centimeters per second. The experimenter decides to specify a type I error probability or significance level of $\alpha = 0.05$ and selects a random sample of n = 25 and obtains a sample average burning rate of $\bar{x} =$ 51.3centimeters per second. What conclusions should be drawn?

b) Assume that the two variables, compressive strength (x) and intrinsic permeability (y) of various concrete mixes and cures are related according to the simple linear regression model. Using the following data, calculate the least squares estimates of the slope and intercept.

$$n = 14, \sum y_i = 572, \sum y_i^2 = 23530, \sum x_i = 43$$
$$\sum x_i^2 = 157.42, \sum x_i y_i = 1697.80$$

Use the equation of the fitted line to predict what permeability would be observed when the compressive strength is 4.3

Q7. a) A random sample of 500 registered voters in Phoenix is asked if they favor the use of oxygenated fuels year-round to reduce air pollution. If more than 315 voters respond positively, we will conclude that at least 60% of the voters favor the use of these fuels. **[7+8=15]**

i. Find the probability of type I error if exactly 60% of the voters favor the use of these fuels.

ii. What is the type II error probability if 75% of the voters favor this action?

b) Obtain a regression plane by using multiple linear regressionto fit the data given below

x	1	2	3	4
y	0	1	2	3
z	12	18	24	30

UNIT IV

Q8. a) A head of department in a college has the problem of assigning courses to teachers with a view to maximize educational quality in his department. He has available to him one professor, two associate professors, and one teaching assistant (TA). Four courses must be offered. After appropriate evaluation, he has arrived at the following relative ratings (100 = best rating) regarding the ability of each instructor to teach each of the four courses. How should he assign his staff to the courses in order to realize his **[7+8=15]**

objective?

	Course 1	Course 2	Course 3	Course 4
Prof 1	60	40	60	70
Prof 2	20	60	50	70
Prof 3	20	30	40	60
TA	30	10	20	40

b) Solve the following LPP using Simplex algorithm.

Max $Z = -2x + 3y$

subject to

$x \leq 5$

$2x - 3y \leq 6$

$x, y \geq 0$

Q9. a) Find the initial basic feasible solution of the following transportation problem using Vogel's Approximation method. **[7+8=15]**

	I	II	III	IV	Supply
A	21	16	25	13	11
B	17	18	14	23	13
C	32	27	18	41	19
Demand	6	10	12	15	

b) Three food products are available at costs of Rs. 10, Rs. 36 and Rs. 24 per unit, respectively. They contain 1,000, 4,000 and 2,000 calories per unit, respectively and 200, 900 and 500 protein units per unit, respectively. It is required to find the minimum-cost diet containing at least 20,000 calories and 3,000 units of protein. Formulate and solve the given problem as an LP problem. Write the dual and using the final simplex table of primal problem, write the solution to the dual problem.

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...D TERM EXAMINATION

FOURTH SEMESTER [B.TECH] JUNE 2024

Paper Code: EEC-206 **Subject: Network Analysis & Synthesis**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit. Assume missing data, if any.

Q1 Attempt all questions: **(3x5=15)**

a) Define graph, tree and co-tree.

b) Find laplace transform of function $f(t)=2u(t-1)-tu(t-4)$.

c) Define hybrid parameters and draw its equivalent circuit.

d) Test whether the polynomial P(s) is Hurwitz or not $P(s)=s^4+7s^3+6s^2+21s+8$?

e) Define characteristic impedance, attenuation and cut off frequency for passive filters.

UNIT-I

Q2 a) Using mesh current analysis, find the drop in the capacitor for the network given in the figure 1 **(8)**

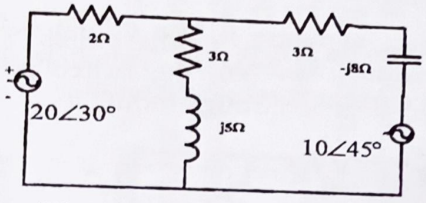

Figure 1

b) Find the Thevenin's equivalent circuit of the network shown **(7)**

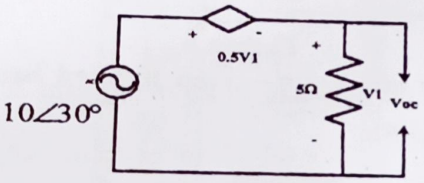

Figure 2

Q3 Obtain the tree from the graph given in figure 3 with links (5,6,7). Find the incidence matrix, fundamental loop matrix, and fundamental cut-set matrix. **(15)**

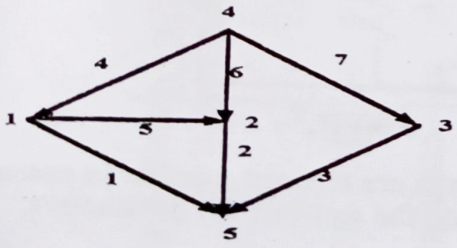

Figure 3

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EEC-206

UNIT-II

Q4 a) The switch in circuit of the figure 4 has been closed for a long time. It opens at t=0. Find $V_c(t)$ for t>0 using classical method. **(9)**

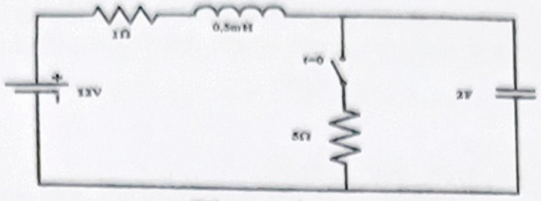

Figure 4

b) Obtain the F(t) of the periodic waveform shown in figure 5. **(6)**

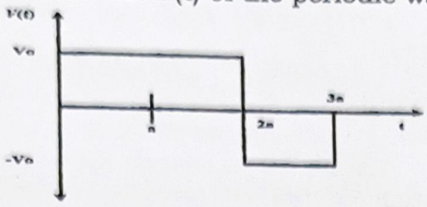

Figure 5

Q5 a) In the circuit shown in figure 6, the switch S is closed and a steady state is reached. At t=0, the switch is opened. Find an expression for $I_L(s)$ current through inductor. **(9)**

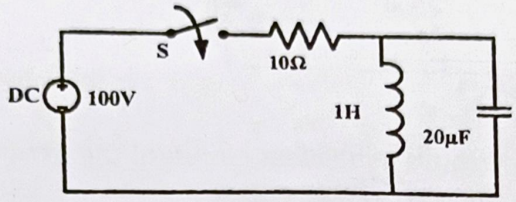

Figure 6

b) Find the current $i(t)=\frac{5}{s(s^2+s+2)}$. Find I(s) and hence determine the value of $i(0^+)$ and $i(\infty)$. **(6)**

UNIT-III

Q6 a) Obtain the Z parameters for the network in Fig. 7. **(8)**

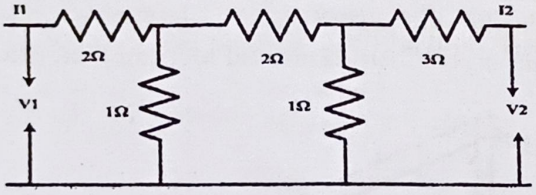

Figure 7

b) If two 2-port networks are chained together in cascade then derive its condition and find the equivalent T parameters. **(7)**

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Q7 a) Determine transmission parameters for the network shown in figure 8 using the concept of interconnection of four two port networks N_1, N_2, N_3, and N_4 in cascade. **(8)**

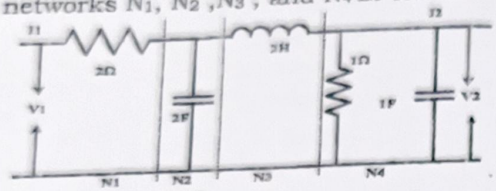

Figure 8

b) For the π network of the figure 9, obtain the Y-parameters (where Y_a, Y_b and Y_c are admittances). **(7)**

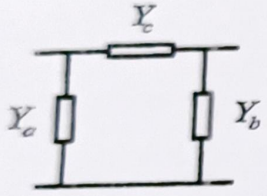

Figure 9

UNIT-IV

Q8 a) Synthesize the network having driving point impedance in the Foster-I and Foster-II form. **(8)**

$$Z(s) = \frac{s(s^2+9)}{(s^2+5)(s^2+13)}$$

b) Check whether the function **(7)**

$$F(s) = \frac{s^2+10s+4}{s+2}$$ is positive real or not.

Q9 Write short notes on

a) Positive real Function and its properties **(6)**

b) Explain Passive filters and their classification **(9)**

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] JUNE 2024

Paper Code: ECC-210 ***Subject: Microprocessors and Microcontrollers***

Time: 3 Hours ***Maximum Marks: 75***

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit.

Q1 Attempt all questions:

a) What do you mean by Arithmetic Logic Unit in computer organization? Explain. **(3)**

b) Write a short note on stacks and subroutines of the 8085 microprocessor. **(3)**

c) Explain the direct memory access concepts. **(3)**

d) Explain the interrupt structure of the 8085 microprocessor. **(3)**

e) Write a short note on hardware-controlled serial I/O using 8251. **(3)**

UNIT-I

Q2 a) What do you mean by computer registers? Explain in detail. **(8)**

b) Explain the addressing modes and instruction formats of computer organization. **(7)**

Q3 a) Explain in detail the evolution of the microprocessors. **(8)**

b) What do you mean by single chip CPU? What are the trends in microprocessor technology? **(7)**

UNIT-II

Q4 a) Explain the architecture of the 8085 microprocessor in detail. **(8)**

b) Write a short note on the instruction set of the 8085 microprocessor. **(7)**

Q5 a) What do you mean by counters and time delays? Explain in detail. **(8)**

b) How is the 8085 microprocessor program implemented using a single-board computer? **(7)**

UNIT-III

Q6 a) Explain the programmed data transfer, serial data transfer and parallel data transfer in the 8085 microprocessor. **(8)**

b) Write a short note on RS-232 and RS-485 standards. **(7)**

Q7 a) Explain the interfacing of EPROM with 8085 microprocessors. **(8)**

b) Explain the interfacing of 8-bitdigital-to-analog converter with 8085 microprocessor. **(7)**

UNIT-IV

Q8 a) Explain in detail the 8255 peripheral interface. **(8)**

b) Explain the interface of switches and LEDs with the 8085 microprocessor. **(7)**

Q9 Write a short note on the following:

a) 8259 programmable interrupt controller. **(8)**

b) 8237 DMA controller **(7)**

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] JUNE 2024

Paper Code: ECC-214 **Subject: Analog Electronics-II**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit. Assume missing data, if any.

Q1 Answer the following: **(3x5=15)**

a) Draw the equivalent circuit of an Op-Amp. Explain the concept of virtual ground in Op-Amp.

b) Show that an Op-Amp can be used as a switch and as an amplifier.

c) What is a differential amplifier? Why are differential amplifiers preferred over single-ended amplifiers?

d) Explain how do you achieve zero crossing detector using a comparator.

e) Discuss the conditions for self-sustained oscillation in feedback amplifiers.

UNIT-I

Q2 a) What are the characteristics of an ideal Op-Amp? Give typical values for Op-Amp IC 741. **(8)**

b) Draw the block diagram of the operational amplifier and explain the function of each block. **(7)**

Q3 a) Draw the circuit diagram of a closed loop non-inverting amplifier using deal Op-Amp and derive the expression for the voltage gain. Explain voltage follower circuit with one application. **(8)**

b) Find the output voltages Vo of the circuits shown in Fig.1 (Assume that the Op-Amp is ideal) Vx=3.9Vpp and Vy = 5.5 Vpp sine wave at 1khz **(7)**

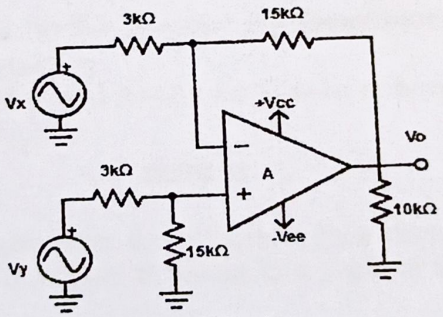

Fig.1

UNIT-II

Q4 a) What is slew rate of an Op-Amp? Find an expression for the maximum frequency of input sine wave f_{max} for undistorted out put voltage of peak value V_m.

An amplifier using an Op-Amp with a slew rate SR =1 V/μ sec has a gain of 40 dB. If this amplifier has to faithfully amplify sinusoidal signals from 10 to 20 kHz, without introducing any slew-rate-induced distortion, calculate the maximum value of the input signal that can be applied without distorting the output. **(8)**

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ECC-214

b) Explain the terms (i)Input bias current (ii) Input offset current (iii) Input offset voltage (iv) Total output offset voltage. **(7)**

Q5 a) Explain how the value of R_{comp} is chosen to nullify the effect of input bias current in a non ideal Op-Amp. Derive the equation for the value of R_{comp}. **(8)**

b) Explain the importance of the parameter CMRR of an Op-Amp. An Op-Amp has 100 dB differential gain and its CMRR is 120 dB. Calculate common mode gain. **(7)**

UNIT-III

Q6 a) Draw the circuit of the Schmitt trigger and explain its working. Why hysteresis is desirable in Schmitt trigger circuits? Derive an expression for hysteresis? **(8)**

b) Find the output voltages Vo of the circuits shown in Fig.2 (Assume that the Op-Amps are ideal). **(7)**

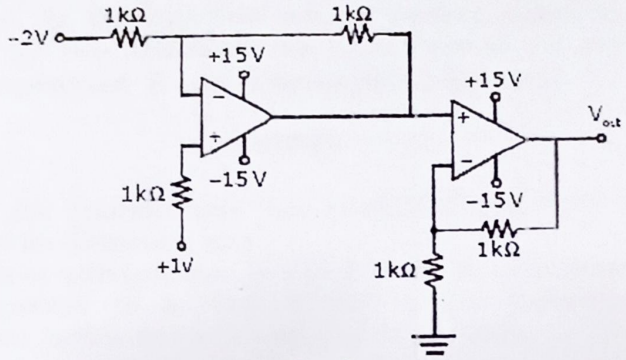

Fig.2

Q7 a) Draw the circuit of a triangular waveform generator using minimum components. Derive an expression for its frequency of oscillation. How this circuit is converted into a ramp generator? **(8)**

b) Draw the circuit of a basic integrator and explain its working. Explain how the gain of an integrator at low frequency can be limited to avoid saturation problem. **(7)**

UNIT-IV

Q8 a) Design a second order low pass filter with upper cut off frequency 1KHz. Label the component values in the diagram. **(8)**

b) Explain Butterworth and Chebyshev filter approximation. **(7)**

Q9 a) Explain the working of monostable multivibrator with 555 timer IC. Derive an expression for its output frequency. **(8)**

b) Draw the block schematic of PLL and explain the function of each block. **(7)**

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] JUNE 2024

Paper Code: ECC-216 **Subject: Electromagnetic Field Theory**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q.no.1 which is compulsory. Select one question from each unit.

Q1 (a) State Gauss law for electric fields. Name two applications of Gauss law in electrostatics. **(3)**

(b) Derive an expression for capacitance of co-axial cable. **(3)**

(c) Explain poissons and Laplace's equations. **(3)**

(d) Describe Snell's Law of refraction and explain the parallel polarization. **(3)**

(e) Derive the expression for VSWR in transmission line. **(3)**

UNIT-I

Q2 (a) A point on Cartesian coordinate system is represented as (-2,4,-1), express its position in cylindrical coordinates. **(7)**

(b) If $\vec{r}$ is the position vector of a point then show that $DIV\,[r/|r^3|\,] = 0$. **(8)**

Q3 (a) Determine the total charge on the cylinder when ρ= 3 m, 0< Z< 4 if $\rho_s = \rho z^2$ nC/m^2. **(5)**

(b) If a potential $V=3x^2\,yz + 2Ay^3 z$, Determine A so that Laplace equation is satisfied. **(5)**

(c) Given the vector field A=10r sin Θ a_θ in spherical co-ordinates, find curl A at $(2, \pi/2, 0)$ **(5)**

UNIT-II

Q4 (a) Derive an expression for magnetic flux density at a point on the circular loop of radius R laying in x-y plane and carrying current I. **(7)**

(b) Determine the force on a 5 ampere current carrying conductor of length 0.06 m which is placed inside the solenoid making an angle 30 degree with the axis of solenoid. Magnetic field due to solenoid is 0.45T. **(8)**

Q5 (a) Derive the Maxwell's equations in differential form .Given $E = E_m$ sin(wt-βz) in free space Find D, B and H. **(7)**

(b) In region 1 for μ_{r1} =3 is defined by x< 0 and region 2 for x> 0 has μ_{r2} = 5 , given that $H_1 = 4.0\,a_x + 3.0a_y - 6.0\,a_z$ (A/m) show that H_2= 7.12 Amp/m and θ_2=19.7 degree. **(8)**

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ECC-216

UNIT-III

Q6 (a) Derive the expression for the attenuation constant ,phase constant and intrinsic impedance for a uniform plane wave in a good conductor. **(7)**

(b) In free space $E(z,t) = 1000 \sin(wt-\beta z)$ V/m ,obtain $H(z,t)$ for the wave determine the propagation constant γ , given that the frequency is 95.5 MHz. **(8)**

Q7 (a) Determine the interface condition of E in perpendicular polarization between two different region. **(6)**

(b) Traveling E and H waves in free space (region 1) are normally incident on the interface with a perfect dielectric (region 2) for which $\epsilon_r = 4.0$ .Calculate the magnitude of the incident, reflected and transmitted E and H waves at the interface. **(9)**

UNIT-IV

Q8 (a) Derive the transmission line equation, and how a Transmission line will be distortion less. **(9)**

(b) A loss-less transmission line of 400 ohms characteristic impedance is connected to a load of 600 ohms. Determine the voltage reflection coefficient and standing wave ratio. **(6)**

Q9 (a) Explain the role of Smith chart in measurement of various parameters in transmission line. **(7.5)**

(b) Derive the expression for input impedance of a transmission line in terms of load impedance and characteristic impedance. **(7.5)**

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