Code No.: **70404** | MR17

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)
Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad

II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019

Subject: **Probability Theory & Stochastic Processes**

Branch: **ECE**

Time: 3 hours **Max. Marks: 60**

PART – A

Answer **ALL** questions of the following **5x2Marks=10 Marks**

1. In an experiment, one card is selected from an ordinary 52 card deck. (i) What is the probability of "selecting a king" (ii) What is the probability of "selecting a jack and queen" simultaneously.
2. Define moments about origin and central moments.
3. Define variance and skew.
4. Define mean-ergodic process.
5. Define power spectral density of random process

PART-B

Answer **ALL** questions of the following **5x10 Marks= 50Marks**

1. Write the classical and axiomatic definitions of Probability and for a three digit decimal number chosen at random, find the probability that exactly K digits are greater than and equal to 5, for $0< K < 3$.

OR

2. (a)What are the conditions for three events A, B, C to be statistically independent?
   (b) In four boxes, Box 1 contains 2000 components of which 5% are defective. Box 2 contains 500 components of which 40% are defective. Box 3 & 4 contain 1000 each with 10% defective. We select at random one of the boxes and we remove at random a single component. What is the probability that the selected component is defective?
3. a) Explain any 4 properties of probability density function.
   b) A random variable X takes the values in the set {-1, -0.5, 0.7, 1.5, 3}, the corresponding probabilities are {0.1, 0.2, 0.1, 0.4, 0.2}. Plot its cumulative distribution function.

OR

4. a) Find a constant b>0 show that the function $f_x(x) = \exp(3x/4)$ for $0\leq x\leq b$ and 0 otherwise is a valid density function.
   b) A random variable X is known to be Poisson with parameter b=4. What is the probability of the event $\{0\leq x\leq 5\}$.
5. a) Define Correlation, Covariance and Correlation coefficient of two random variables.
   b) Prove the following for two independent random variable X and Y:
   (i) E[XY]=E[X] E[Y] (ii) Covariance, $C_{XY}= 0$

OR

6. The joint pdf of two random variables X and Y is

$$f_{X,Y}(x, y) = \begin{cases} x+y; & 0 < x < 1,\ 0 < y < 1 \\ 0, & otherwise \end{cases}$$

   Find (i) Marginal density functions $f_X(x)$ and $f_Y(y)$ (ii) Mean value of X and Y.
7. a) Explain the concept of time average and ergodicity. Write the conditions for a random process to be ergodic in mean and autocorrelation.
   b) Classify random processes and explain.

OR

8. A random process Y (t) = X (t) - X (t + τ) is defined in terms of a process X (t). That is at least wide sensestationary.
   a) Show that mean value of Y (t) is 0 even if X (t) has a non-zero mean value.
   b) If Y (t) = X (t) +X (t + τ) find E[Y (t)] and σY^2.
9. A random process had auto-correlation function $R_{xx}(\tau) = \begin{cases} 1-|\tau|; & |\tau| \leq 1 \\ 0; & otherwise \end{cases}$ Find its power-spectral density(PSD).

OR

10. a) Derive the relationship between auto-correlation function and PSD.
    b) A random process has the power density spectrum $S_{xx}(w)= 6w^2/(1+w^4)$ find the average power in the process.

Code No.: **70B02** **MR17**

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019

Subject: **Computational Mathematics**

Branch: **ECE**

Time: 3 hours **Max. Marks: 60**

PART – A

Answer **ALL** questions of the following **5x2Marks=10 Marks**

1. If $f(x) = x^3 - 2x - 5 = 0$,by the method of false position, find the fourth approximation to the required root.
2. Write the Gauss forward interpolation formula.
3. Write the normal equations to fit a curve of the form $y = ae^{bx}$
4. Write Adams-Bashforth predictor formula and corrector formula
5. What are different types of PDE's How do you classify them.

PART-B

Answer **ALL** questions of the following **5x10 Marks= 50Marks**

1. a) Using Regula-Falsi method solve $x\log_{10}x - 1.2 = 0$ correct to 3 decimal places

   b) Establish iterative formula for finding a real root of $x^3 - K = 0 (K > 0)$ using Newton Rapson method. Hence find $3^{1/3}$.

OR

2. Solve the system of equations 4x+y+z = 4, x +4y -2z = 4, 3x +2y- 4z =6, by Jacobi iterative method.
3. (a) Find y(25) using Gauss forward difference formula using the following table:

X:	20	24	28	32
Y:	24	32	35	40

   (b) By Lagrange's interpolation formula, find the value of x for which y is 0.5. The x and y are related by $y = \frac{2}{\sqrt{\pi}} \int_0^x e^{-x^2} dx$ and (0.46, 0.4846555), (0.47, 0.4937452), (0.48, 0.5027498), (0.49, 0.5116683) are 4 points on the curve.

OR

4. a)Apply Gauss forward central difference formula and estimate f (32) from the following table

x	25	30	35	40
y=f(x)	0.2707	0.3027	0.3386	0.3794

   b) Find a parabola passing through the points (0, 1), (1 , 3) and (3,55) using Lagrange's interpolation formulae.

5. a) Fit a least square geometric curve $y=ax^b$ to the following data:

X:	1	2	3	4	5
Y:	0.5	2	4.5	8	12.5

b) From the following table of values of x and y obtain $\frac{d^2y}{dx^2}$ at x=1.2

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

OR

6. a) Fit a least square geometric curve $y=ae^{bx}$ to the following data:

X:	0	1	2	3
Y:	1.05	2.10	3.85	8.30

b) From the following table of values of x and f(x) determine $f'(0.23)$

x	0.20	0.22	0.24	0.26	0.28	0.30
f(x)	1.6596	1.6698	1.6804	1.6912	1.7024	1.7139

7. Find y(0.8) using Milne's predictor corrector method given that $\frac{dy}{dx} = x - y^2$ by evaluating the y(0.2), y(0.4), y(0.6) by Euler's method (take h = 0.2)

OR

8. a) Solve the following using R - K fourth method y' = y - x, y (0) = 2, h=0.2. find y(0.2).

b) Given $\frac{dy}{dx} = \frac{1}{1+y^2}$, y (0) = 0, y (0.2) = 0.2027, y (0.4) = 0.4228, y (0.6) = 0.6841 estimate y (0.8), y (1) using Milne's method.

9. Find the solution of the parabolic equation $u_{xx} = 2u_t$ when u(0, t) = u(4, t) = 0 and u(x, 0) = x(4-x), taking h = 1. Find the values up to t = 5.

OR

10. Solve $\nabla^2 u = 0$ under the conditions (h =1,k=1),u(0,y) = 0, u(4,y) = 12 + y for $0 \leq y \leq 4$;
u (x,0) = 3x, u(x,4) = x^2 for $0 \leq x \leq 4$.

Code No.: **70403** **MR17**

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019

Subject: **Signals and Systems**

Branch: **ECE**

Time: 3 hours **Max. Marks: 60**

PART – A

Answer **ALL** questions of the following **5x2Marks=10 Marks**

1. Define and sketch unit impulse signal.
2. Define Fourier transform. And write mathematical expression.
3. Define the transfer function of an LTI system.
4. Find the Laplace Transform of $x(t) = tu(t)$.
5. Derive the relation between Z-Transform and DTFT.

PART-B

Answer **ALL** questions of the following **5x10 Marks= 50Marks**

1. a) Derive the expression for component vector of approximating the function $f_1(t)$&$f_2(t)$&Derive C_{12}.
   b) Calculate power of signals: i) x(t) =8cos(4t)cos(6t). ii) x(t) =2sin(300 π t).

OR

2. a) Prove that $\sin(n\omega_0 t)$ & $\sin(m\omega_0 t)$ are orthogonal over any interval$(t0, t0+2\pi/\omega_0)$for integral values of n&m
   b) Explain the Orthogonality concept between two complex functions $f_1(t)$&$f_2(t)$ for a real variable t
3. a) Explain the sampling theorem for band limited signals with graphical proof
   b) Determine the nyquist rate corresponding to each of the following signals
   i) $x_1(t)$ = 1+cos200π t +sin400π t ii) $x_2(t)$ = sin (4000π t) /(4000π t)

OR

4. a) Find the Fourier Transform of Signum function.
   b) Explain reconstruction of the signal from its sampled signal.
5. a) Calculate $x(n) * h(n)$ Where $x(n) = \{1, -2, \underset{\uparrow}{-1}\}$ and $h(n) = \{-2, 3, -1\}$

   b) Let the system function of a LTI system be H(w)= $\frac{1}{jw+2}$ what is the output of the system for an input x(t) =e^{-t} u(t).

OR

6. a) What is the importance of convolution and explain the graphical convolution with an example
   b) Determine the cross correlation between the two sequences: x(n)={1,0,0,1}, and h(n)={4,3,2,1}
7. Consider a stable LTI system that is characterized by the differential equation $\frac{dy(t)}{dt} + 5y(t) = x(t)$ With initial conditions $y(0^+)$=2.determine the output for an input of x(t)=$3e^{-2t}$u(t).

OR

8. Find the laplace transform for the following signals .i)δ(t) ii) u(t) iii)e^{-at}u(t) iv)sin(at)u(t)
9. Determine the Z transform of $x(n) = cos(w_0 n)u(n)$.

OR

10. The system function of the LTI system is given as H(Z) = $\frac{3-4z^{-1}}{1-3.5z^{-1}+1.5z^{-2}}$ determine h(n).

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019

Subject: **Electrical Technology**

Branch: **ECE**

Time: 3 hours **Max. Marks: 60**

PART – A

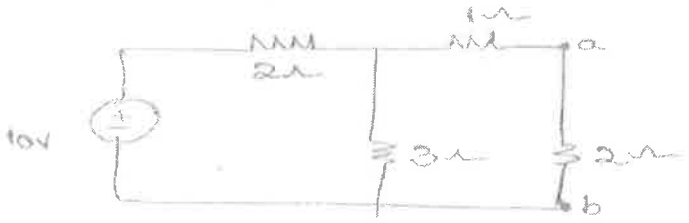
Answer **ALL** questions of the following **5x2Marks=10 Marks**

1. State Maximum Power Transfer Theorem
2. Derive the unit of L/R ratio for a series RL circuit.
3. Write the applications DC Series and Shunt Motors?
4. Differentiate Slip ring and squirrel cage induction motor
5. Define relationship between Z-h parameter set?

PART-B

Answer **ALL** questions of the following **5x10 Marks= 50Marks**

1. Show the application of reciprocity theorem in the network shown in figure.



OR

2. Find the Norton's equivalent circuit across the open circuit terminals in Fig 6(a)

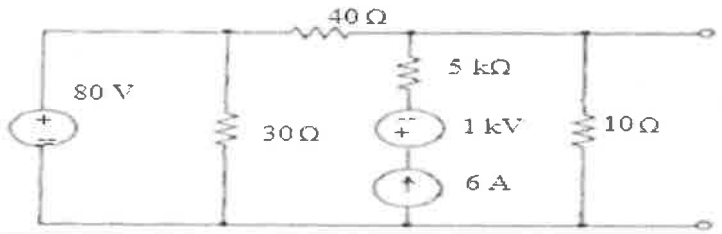
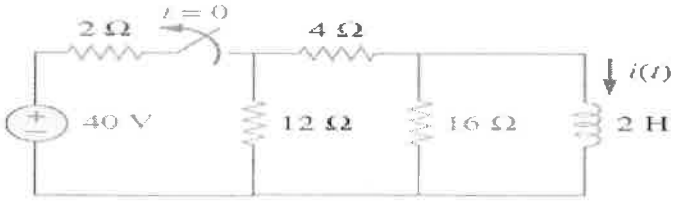


Fig 6(a)

3. Explain the transient response in time domain with constant DC excitation as a input for a RL circuit. Draw voltage waveform across R & L using differential equation approach.

OR

4. The switch in the circuit of Fig. below has been closed for a long time. At t = 0 the switch is opened. Calculate i(t) for t > 0.



5. A long shunt compound generator delivers a load current of 400A at a terminal voltage 250V armature resistance of 0.04Ω shunt field resistance is 125Ω & series field resistance is 0.01Ω. find the induced emf. Allow drop of 1V per brush.

OR

6. (a) Derive emf equation for a DC machine.

   (b) A 250 V shunt motor takes a total current of 20 A, The shunt field and armature resistances are 200 Ω and 0.3 Ω respectively. Determine (i) The value of back emf (ii) Gross mechanical power in the arnature.

7. A 200 / 50V, 50 Hz, single phase is connected to a 200 V, 50Hz supply with secondary open primary winding has 400 turns (i) What is the value of maximum flux through the core if the primary winding has 400 turns (ii) What is the peak value of flux, if the primary voltage is 200 V, 25 Hz.

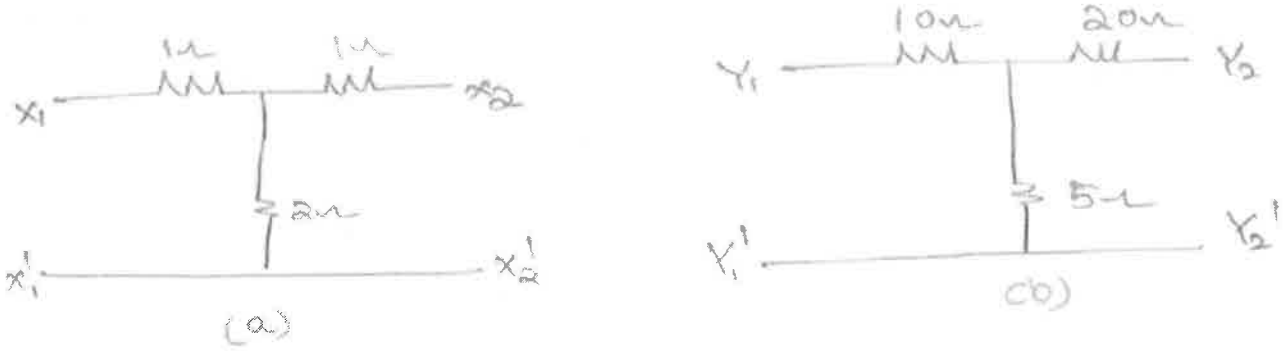
OR

8. a) A 6 pole alternator running at 1000 rpm supplies an 8 pole induction motor. Find the actual speed of the motor if the slip is 2. 5%

   b) An alternator on open circuit generates 360 V at 60 Hz when field current is 3.6 A. Neglecting saturation, determine the open circuit emf when the frequency is 40 Hz and field current is 2.4A.

9. a) Explain the parallel connection of 2 two port networks

   b) Two networks shown in figure (a) and(b) are connected in series. obtain the Z-parameters of the combination



OR

10. (a) Derive the relation between ABCD & Z parameters.

    (b) A two port network has the following parameters $Z_{11} = 4\Omega$ $Z_{12} = 1\Omega$, $Z_{21} = 3\Omega$ & $Z_{22} = 3\Omega$. Calculate short circuit admittance parameters.

Code No.: **70B03** **MR17**

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019

Subject: **Advanced Calculus**

Branch: **Common to CE, ME, EEE, ECE,CSE & IT**

Time: 3 hours **Max. Marks: 60**

PART – A

Answer **ALL** questions of the following **5x2Marks=10 Marks**

1. Solve $pq + qx = y$
2. State Stoke's theorem.
3. $If \emptyset(x,y,z) = 3x^2y - y^2z^2$, find $\nabla\emptyset$ at the point (1,-2,-1).
4. Evaluate $\int_0^{\frac{\pi}{2}}\int_{\frac{\pi}{2}}^{\pi} \cos(x+y)\,dxdy$
5. Verify Cauchy's mean value theorem for $f(x) = \sin x$ and $g(x) = \cos x$ on $\left[0, \frac{\pi}{2}\right]$.

PART-B

Answer **ALL** questions of the following **5x10 Marks= 50Marks**

1. a) Using mean value theorem, for $0 < a < b$ prove that $1 - \frac{a}{b} < \log\left(\frac{b}{a}\right) < \frac{b}{a} - 1$ and hence Deduce that $\frac{1}{6} < \log\left(\frac{6}{5}\right) < \frac{1}{5}$

   b) Expand $e^{x\sin x}$ in powers of x

OR

2. a) If a < b, prove that $\frac{b-a}{1+b^2} < \tan^{-1} b - \tan^{-1} a < \frac{b-a}{1+a^2}$ using Lagrange's mean value theorem and hence deduce $\frac{5\pi+4}{20} < \tan^{-1} 2 < \frac{\pi+2}{4}$.

   b) Verify if $u = \frac{x-y}{x+y}, v = \frac{xy}{(x+y)^2}$ are functionally dependent and if so, find the relation between them.

3. a) $Evaluate \int_0^{\log 2}\int_0^{x}\int_0^{x+\log y} e^{x+y+z}\,dzdydx.$

   b) Using cylindrical co-ordinates find the volume of the cylinder with base radius a and height h.

OR

4. Evaluate $\int_0^1\int_x^{\sqrt{x}}(x^2+y^2)dxdy$

5. a) If $\vec{a}$ is a differentiable function and ϕ is a differentiable scalar function then prove that

$div\left(\phi \vec{a}\right) = (grad\phi).\vec{a} + \phi div\,\vec{a}$

b) Calculate the angle between the normal's to the surface $xy = z^2$ at the points $(4,1,2)\,and\,(3,3,-3)$

OR

6. a) Prove that $div(r^n\vec{r}) = (n+3)r^n, \vec{r} = xi + yj + zk$ [6M]

b) Find $curl(\vec{f}), where \vec{f} = grad(x^3 + y^3 + z^3 - 3xyz)$ [4M]

7. a) Find the work done in moving a particle in the force field $\vec{f} = 3x^2\,\vec{i} + (2xz - y)\vec{j} + z\,\vec{k}$ along the straight line from $(0,0,0)\ to\ (2,1,3)$

b) If $\vec{f} = (2x^2 - 3z)\,\vec{i} - 2xy\,\vec{j} - 4x\,\vec{k}$ then evaluate $\int_V \nabla.\vec{f}\,dv$ where V is the closed region

bounded by x = 0,y = 0,z = 0, 2x+2y+z = 4

OR

8. Verify stoke's theorem for $\vec{f} = \left(x^2 + y^2\right)\vec{i} - 2xy\,\vec{j}$ taken round the rectangle bounded by the lines $x = \pm a,\ y = 0,\ y = b$

9. a) Form a partial differential equation by eliminating the arbitrary constants a, b, c from

$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$

b) Solve $x^2(z-y)p + y^2(x-z)q = z^2(y-x)$

OR

10. a) Form the partial differential equation by eliminating arbitrary function f from

$f\left(x^2 + y^2,\ x^2 - z^2\right) = 0$

b) Solve the P.D.E $px + qy = pq$ by Charpit's method.

Code No.: **70402** | **MR17**

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019

Subject: **Switching Theory & Logic Design**

Branch: **Common to EEE & ECE**

Time: 3 hours **Max. Marks: 60**

PART – A

Answer **ALL** questions of the following **5x2Marks=10 Marks**

1. Give an example of a Self-Complementing code?
2. What is the difference between Karnaugh Map and Tabular method?
3. Draw the full subtractor using two half subtractors?
4. what are the various methods used for triggering of a Flip-Flop
5. What is the basic difference between Mealy and Moore state machines?

PART-B

Answer **ALL** questions of the following **5x10 Marks= 50Marks**

1. Determine the single error correcting code for the information code 10111 for odd parity.

OR

2. The message below coded in the 7-bit hamming is transmitted through a noisy channel. Decode the message assuming that at least a single error occurred in code word 0011011.
3. a) Simplify the following function using K-map F(A, B, C, D)=> (1, 3, 4, 5, 6 11, 13, 14, 15).
   b) State and prove consensus theorem?

OR

4. a) Reduce the following Boolean expressions. i. (AB'+AC')(BC+BC')(ABC) ii. AB'C+A'BC+ ABC
   b) Distinguish between canonical and simple forms by giving example?
5. a) Design 4 line to 16 line decoder using 2 line to 4 line decoders?
   b) Design a code converter that converts BCD into Binary

OR

6. Explain the implementation of 4-bit priority encoder with truth table, k-maps, Boolean functions and schematic diagrams?
7. a) Explain the operation of clocked SR flip flop
   b) Design a Universal Shift Register

OR

8. a) Draw the truth table, logic diagrams of J-K, R-S, D and T type flip flops
   b) Convert a T flip flop to D flip flop and write characteristic equations of T and D flip flops .
9. a) What are the capabilities and limitations of FSM?
   b) Find the equivalence partition and reduced table for the given state machine.

P.S	N.S. , O/P	
	X = 0	X = 1
A	B,0	E,0
B	E,0	D,0
C	D,1	A,0
D	B,1	E,0
E	C,0	D,0

OR

10. A long sequence of pulses enters a 2-input, 2-output synchronous sequential circuit which is required to produce an output Z=1, whenever the sequence 1111 occurs. Overlapping sequences are accepted for example, if input is 01011111, the required output is 00000011, design the circuit.

Code No.: **70401** **MR17**

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019

Subject: **Electronic Circuits - I**

Branch: **Common to EEE & ECE**

Time: 3 hours **Max. Marks: 60**

PART – A

Answer **ALL** questions of the following **5x2Marks=10 Marks**

1. Write any four transistor specifications.
2. Draw the symbols of JFET and MOSFET.
3. What is the need of biasing?
4. Define h-parameters for a transistor.
5. Draw a common gate amplifier circuit.

PART-B

Answer **ALL** questions of the following **5x10 Marks= 50Marks**

1. a) Explain BJT construction and operation. (7M)
   b) Draw the symbols of npn and pnp transistors. (3M)

OR

2. a) Explain the input and output characteristics of a transistor in CB configuration. (7M)
   b) Describe the two types of breakdown in transistors. (3M)
3. Describe the construction &working principle of Enhancement mode MOSFET &draw its characteristics

OR

4. Explain the operation of N-channel enhancement type MOSFET with the help of it's (I_D - V_{DS}) and (I_D - V_{GS}) characteristics.
5. a) A silicon transistor having β =100, Vbe=0.6v is used in a fixed bias amplifier circuit where Vcc=16V, Rc=5KΩ and R_B=790 KΩ. Determine its operating point. (7M)
   b) Explain stability factor with β and Ico (3M)

OR

6. a) What is a biasing? Explain the need of it. List out different types of biasing methods.
   b) In Silicon transistor with fixed bias circuit V_{CC}=9V, R_C=3KΩ, R_B=8KΩ, β=50, V_{BE}=0.7V. Find the operating point and Stability factor.
7. Draw the circuit diagram of CB amplifier using hybrid parameters and derive the expressions for A_I, A_V, R_i and R_O.

OR

8. Prove Miller's Theorem.
9. a) Derive the expression for voltage gain for CS amplifier with resistive load. (7M)
   b) Define transconductance. (3M)

OR

10. Explain the low frequency response of common collector amplifier.