CBCS SCHEME

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17MAT11

First Semester B.E. Degree Examination, July/August 2022
Engineering Mathematics – I

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Find the n^{th} derivative of i) x^2e^{5x} ii) $\cos 2x \cos x$. **(06 Marks)**

b. Find the angle between the curves $r = a\theta$ and $r = \frac{a}{\theta}$. **(07 Marks)**

c. Find the pedal equation of the curve $r = a(1 + \cos\theta)$. **(07 Marks)**

OR

2 a. If $x = \tan(\log y)$ prove that $(1+x^2)y_{n+1} + (2nx-1)y_n + n(n-1)y_{n-1} = 0$. **(06 Marks)**

b. Prove with usual notation $\tan\phi = r\left(\frac{d\theta}{dr}\right)$. **(07 Marks)**

c. Find the radius of curvature of the curve $y = 4\sin x - \sin 2x$ at $x = \pi/2$. **(07 Marks)**

Module-2

3 a. Expand $2x^3 + 7x^2 + x - 6$ in power of $(x-2)$ using Taylor's theorem. **(06 Marks)**

b. Evaluate: i) $\lim_{x \to 0} \frac{a^x - b^x}{x}$ ii) $\lim_{x \to 0} \left(x^x\right)$ **(07 Marks)**

c. If $u = \frac{2yz}{x} : V = \frac{3zx}{y}$ $W = \frac{4xy}{z}$ find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$. **(07 Marks)**

OR

4 a. If $u = \sin^{-1}\left(\frac{x^2y^2}{x+y}\right)$ prove that $xu_x + yu_y = 3\tan u$. **(06 Marks)**

b. Using Maclaurin's series prove that $\frac{1}{1+x} = \sum_{n=0}^{\infty}(-1)^n x^n$. **(07 Marks)**

c. Find $\frac{dU}{dt}$, if $u = x^3y^2 + x^2y^3$ where $x = at^2$, $y = 2at$ using partial derivatives. **(07 Marks)**

Module-3

5 a. A particle moves along the curve C: $x = t^3 - 4t$, $y = t^2 + 4t$, $z = 8t^2 - 3t^3$ where 't' denotes time. Find the components of its acceleration at $t = 2$ along the tangent. **(06 Marks)**

b. Find the value of "a" such that $\vec{F} = (axy - z^3)\hat{i} + (a-2)x^2\hat{j} + (1-a)xz^2\hat{k}$ is irrotational. Also find a scalar function ϕ such that $\vec{F} = \nabla\phi$. **(07 Marks)**

c. Prove that $\text{div}(\text{curl}\vec{A}) = 0$. **(07 Marks)**

OR

6 a. Find the divergence and curl of vector $\vec{F} = (xyz)\hat{i} + (3x^2y)\hat{j} + (xz^2 - y^2z)\hat{k}$ at $(2,-1,1)$. **(06 Marks)**

b. Find the directional derivative of $\vec{F} = xy^2 + yz^3$ at (2, -1, 1) in the direction of the vector $\hat{i} + 2\hat{j} + 3\hat{k}$. **(07 Marks)**

c. Prove that curl (grad ϕ) = $\vec{0}$. **(07 Marks)**

Module-4

7 a. Obtain the reduction formula for $\int \sin^n x dx$. **(06 Marks)**

b. Solve: $x\frac{dy}{dx} + y(\log y) = xye^x$. **(07 Marks)**

c. Water at temperature 30°C takes 5 minutes to warm upto 50°C in a room temperature of 60°C. Find the temperature after 20 minutes. **(07 Marks)**

OR

8 a. Evaluate $\int_0^\infty \frac{x^2}{(1+x^2)^{7/2}} dx$. **(06 Marks)**

b. Solve: $(2xy + e^y)dx + (x^2 + xe^y)dy = 0$. **(07 Marks)**

c. Find the orthogonal trajectory of the family of curve $r^2 = a\sin 2\theta$. **(07 Marks)**

Module-5

9 a. Solve the system of equations by Gauss Seidal method.
$30x - 2y + 3z = 75$; $2x + 2y + 18z = 30$; $x + 17y - 2z = 48$, carry out three iteration. **(06 Marks)**

b. Diagonalise the matrix $A = \begin{pmatrix} 1 & 1 \\ 3 & -1 \end{pmatrix}$. **(07 Marks)**

c. Using Rayleigh's power method, find largest Eigen value and corresponding Eigen vector of the matrix $\begin{pmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{pmatrix}$ choosing $X_0 = [1\ 0\ 0]^T$. **(07 Marks)**

OR

10 a. Find the Rank of the matrix $\begin{bmatrix} 1 & 2 & -1 & 3 \\ 4 & 1 & 2 & 1 \\ 3 & -1 & 1 & 2 \\ 1 & 2 & 0 & 1 \end{bmatrix}$. **(06 Marks)**

b. Reduce the quadratic form $6x^2 + 3y^2 + 3z^2 - 4xy - 2yz + 4xz$ into canonical form, using orthogonal transformation. **(07 Marks)**

c. Apply Gauss-Jordan method to find the solution of system of equations
$x + 2y + z = 3$, $3x - y + 2z = 13$, $2x + 3y + 3z = 10$. **(07 Marks)**

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17MAT21

Second Semester B.E. Degree Examination, July/August 2022
Engineering Mathematics – II

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Solve : $(4D^4 - 4D^3 - 23D^2 + 12D + 36)\, y = 0$, where $D = \frac{d}{dx}$. (06 Marks)

b. Solve $\frac{d^3y}{dx^3} + y = 65\cos(2x+1)$. (07 Marks)

c. Solve : $y'' + 4y = x^2 + e^{-x}$ by the method of undetermined co-efficients. (07 Marks)

OR

2 a. Solve $\frac{d^2y}{dx^2} - 4y = \cosh(2x-1) + 3^x$. (06 Marks)

b. Solve $(D^2 + D + 1)y = 1 - x + x^2$. (07 Marks)

c. Solve $\frac{d^2y}{dx^2} + y = \frac{1}{1+\sin x}$ by the method of variation of parameters. (07 Marks)

Module-2

3 a. Solve $x^3\frac{d^3y}{dx^3} + 3x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} = x^3$. (06 Marks)

b. Solve $p^2 + 2py\cot x = y^2$. (07 Marks)

c. Modify the following equations into Clairaut's form and hence obtain its general and singular solution. $xp^2 - py + Kp + a = 0$. (07 Marks)

OR

4 a. Solve $(3x+2)^2 y'' + 3(3x+2)y' - 36y = 8x^2 + 4x + 1$. (06 Marks)

b. Solve $p(p+y) = x(x+y)$. (07 Marks)

c. Solve $(px - y)(py + x) = 2p$ by reducing it to Clairaut's form, by taking the substitution $X = x^2$, $Y = y^2$. (07 Marks)

Module-3

5 a. Form a PDE by eliminating arbitrary functions $\phi(x + y + z,\ x^2 + y^2 - z^2) = 0$. (06 Marks)

b. Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$ for which $\frac{\partial z}{\partial y} = -2\sin y$ where x = 0 and z = 0 if y is an odd multiple of $\frac{\pi}{2}$. (07 Marks)

c. Derive one dimensional wave equation in the form $\frac{\partial^2 u}{\partial t^2} = C^2\frac{\partial^2 u}{\partial x^2}$. (07 Marks)

OR

6 a. Form a PDE by eliminating arbitrary functions, $z = yf(x) + x\phi(y)$. **(06 Marks)**

b. Solve the equation $\frac{\partial^2 z}{\partial x^2} + z = 0$ given that $z = e^y$ and $\frac{\partial z}{\partial x} = 1$ when $x = 0$. **(07 Marks)**

c. Find various possible solution of one dimensional heat equation, by the method of separation of variables. **(07 Marks)**

Module-4

7 a. Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dz\, dy\, dx$. **(06 Marks)**

b. Evaluate $\int_1^2 \int_1^{x^2} (x^2 + y^2) dy\, dx$ by changing the order of integration. **(07 Marks)**

c. Derive the relation between Beta and Gamma function as $\beta(m,n) = \frac{\Gamma m \Gamma n}{\Gamma m+n}$. **(07 Marks)**

OR

8 a. Evaluate $\iint_R x^2 y\, dxdy$, where R is the region bounded by the lines $y = x$, $y + x = 2$ and $y = 0$. **(06 Marks)**

b. Evaluate $\int_0^a \int_0^{\sqrt{a^2-y^2}} y\sqrt{x^2+y^2}\, dx\, dy$ by changing into polars. **(07 Marks)**

c. Show that $\int_0^\infty x.e^{-x^8} \times \int_0^\infty x^2.e^{-x^4} dx = \frac{\pi}{16\sqrt{2}}$. **(07 Marks)**

Module-5

9 a. Find the Laplace transform of $2^t + \frac{\cos 2t - \cos 3t}{t}$. **(06 Marks)**

b. If $f(t) = \begin{cases} t, & 0 \le t \le a \\ 2a - t, & a \le t \le 2a \end{cases}$, $f(t+2a) = f(t)$

Sketch the graph of $f(t)$ as a periodic function and show $L[f(t)] = \frac{1}{s^2}\tanh\left(\frac{as}{2}\right)$. **(07 Marks)**

c. Find the inverse Laplace transform of $\frac{s^2}{(s^2+a^2)^2}$, using convolution theorem. **(07 Marks)**

OR

10 a. Express $f(t) = \begin{cases} \cos t: & 0 < t \le \pi \\ 1: & \pi < t \le 2\pi \\ \sin t: & t > 2\pi \end{cases}$ in terms of unit step function and hence find its Laplace transform. **(06 Marks)**

b. Find the inverse Laplace transform of $\frac{5s+3}{(s-1)(s+1)^2}$. **(07 Marks)**

c. Solve the differential equation $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = e^{2x}$, $y(0) = 2$, $y'(0) = 1$ using Laplace transform method. **(07 Marks)**

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17PCD13/23

First/Second Semester B.E. Degree Examination, July/August 2022
Programming in C and Data Structures

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define algorithm. Write a pseudo code to find the sum and average of given three numbers. (06 Marks)

b. Write a general structure of C. Explain with an example. (06 Marks)

c. Explain identifiers. Discuss the rules to be followed while naming identifiers. Give examples. (08 Marks)

OR

2 a. What is Type Conversion? What are different types of Type Conversion? Explain with example. (08 Marks)

b. Explain different types of input output functions in C with syntax and examples. (06 Marks)

c. List all operations used in C. Give example. (06 Marks)

Module-2

3 a. Write the difference between while and do-while loop along with syntax and example. (08 Marks)

b. Explain break, continue and go to statement with syntax and examples. (08 Marks)

c. Write a C program to find factorial of 'n' by using while loop. (04 Marks)

OR

4 a. Write a C program to implement a calculator program, that accepts values and operator from user. (07 Marks)

b. List the types of looping statements in C. Explain any two with syntax and example. (07 Marks)

c. Develop a C program to read a year as an input and find whether it is leap year or not. (06 Marks)

Module-3

5 a. Define an array. Explain different methods of initialization of one dimensional and two dimensional array. (08 Marks)

b. Explain function prototype, function call, function definition with example to each. (08 Marks)

c. Explain string declaration and initialization with examples. (04 Marks)

OR

6 a. Explain two categories of argument passing technique with examples. (08 Marks)

b. What is recursion? Write a C program to compute polynomial coefficient ncr using recursion. (06 Marks)

c. Write a C program to read N elements and find the biggest element in the array. (06 Marks)

Module-4

7 a. What is structure? Explain the C syntax of structure declaration with example. **(04 Marks)**

b. Write a C program to pass structure variable as function argument. **(06 Marks)**

c. What is a FILE? Explain any five manipulation functions with example. **(06 Marks)**

d. Give an example for array of structure and explain it in detail. **(04 Marks)**

OR

8 a. Write a C program to maintain a record of 'n' students details using an array of structures with four fields (roll no, name, marks and grade). Assume appropriate data type for each field. Print the marks of the student given the student name as input. **(08 Marks)**

b. Explain structure within a structure with an example. **(06 Marks)**

c. Explain the following input and output file functions:
(i) putc( ) (ii) fputs( ) (iii) getc( ) (iv) fgets( ) **(06 Marks)**

Module-5

9 a. What is pointer? Write a C program to find the sum and mean of all elements in an array using pointer. **(10 Marks)**

b. What is dynamic memory allocation? Explain different dynamic memory allocation functions in C. **(06 Marks)**

c. Define stack. Explain operations of stack with neat diagram. **(04 Marks)**

OR

10 a. Write a C program to swap two numbers using call by pointers (address) method. **(06 Marks)**

b. Explain how pointers and arrays are related with example. **(04 Marks)**

c. Explain any two pre-processor directories in C. **(04 Marks)**

d. Write a short note on linked list and trees. **(06 Marks)**

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17ELE15/25

First/Second Semester B.E. Degree Examination, July/August 2022
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. State and explain with neat diagram, Kirchhoff's laws for electric circuits. **(06 Marks)**

b. Explain coefficient of magnetic coupling and develop an expression for the same. **(07 Marks)**

c. Determine the current in the branches of the network in Fig. Q1 (c).

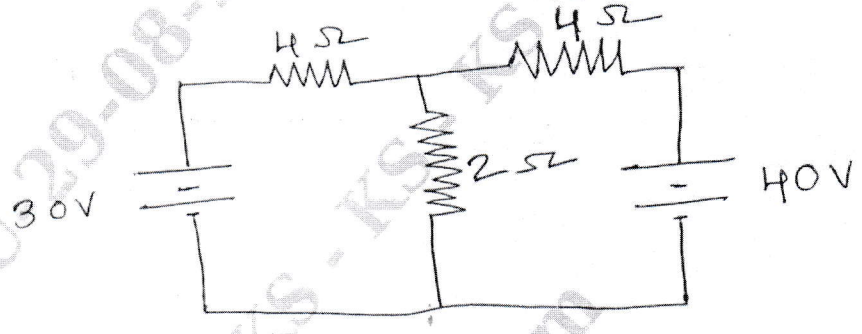

Fig. Q1 (c) **(07 Marks)**

OR

2 a. State and explain Lenz's law and Fleming's right hand rule. **(06 Marks)**

b. In a pair of coupled coils, coil A has 600 turns and carries a current of 2.5 Amps and total flux due to coil is 1.2 mwb and mutual flux 0.8 mwb. If coil 'B' has 2000 turns determine L_1, L_2, m and K. **(07 Marks)**

c. Determine the power dissipated in each resistance of the circuit shown in Fig. Q2 (c) and voltage drop across 5 Ω resistor.

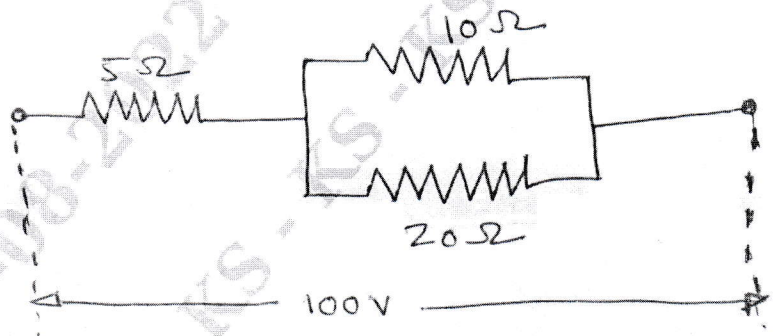

Fig. Q2 (c) **(07 Marks)**

Module-2

3 a. With neat sketch, describe the construction of a Dynamo meter type wattmeter. **(08 Marks)**

b. Derive an expression for torque developed by a dc motor. **(06 Marks)**

c. An 8-pole lap connected armature has 960 conductors, a flux of 40 mwb per pole and a speed of 400 rpm. Determine the EMF generated. If the armature were wave connected at what speed it must be driven to generate 400 volts. **(06 Marks)**

OR

4 a. Draw the curved of armature Current Vs Speed and Armature current Vs Torque of d.c. series and shunt motors. **(06 Marks)**

b. With neat sketch, explain principle operation of induction type energy meter. **(07 Marks)**

c. The armature of a 4-pole shunt motor has a lap winding accommodated in 60 slots, each containing 20 conductors. If the useful flux per pole is 23 mwb, calculate the total torque developed when the armature current is 50 A. Also calculate back E.m.f when speed of the motor is 1400 rpm. **(07 Marks)**

Module-3

5 a. Define average value, root mean square value, form factor and peak factor of sinusoidally varying quantities. **(08 Marks)**

b. Explain with neat sketch plate earthing. **(06 Marks)**

c. The resistance of a coil is 140 Ω and its inductance 0.85 H. Determine the current, p.f. and circuit impedance when coil is connected to 120 V, 60 Hz supply. **(06 Marks)**

OR

6 a. Explain three way control of lamps with truth table and connection diagram. **(06 Marks)**

b. A 230 V, 50 Hz as supply is applied to coil of 0.06 H inductance and 2.5 Ω resistance connected in series with a 6.8 μF capacitor. Calculate impedance, current, phase angle between current and voltage, power factor and power consumed. **(08 Marks)**

c. Determine the total impedance and current drawn by supply of the circuit shown in Fig. Q6 (c). **(06 Marks)**

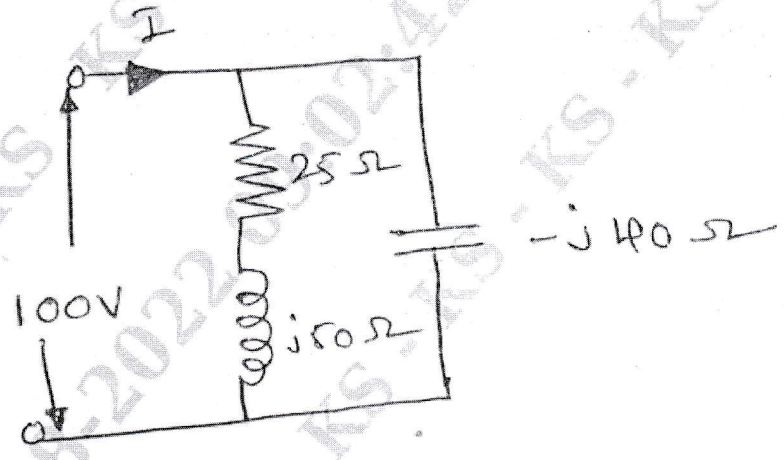

Fig. Q6 (c)

Module-4

7 a. Mention advantages of three phase system. **(05 Marks)**

b. A balanced 3 phase star connected load is fed from 208 volt, 3-phase supply. Each leg of load has a impedance of $(15 + j20)\Omega$. Determine, power factor, active power, reactive power, the phase current and line current of the system. **(08 Marks)**

c. A 50 Hz, 6-pole synchronous generator has 36 slots and 20 conductors per slot. The flux per pole is 0.016 wb. Determine phase and line induced emf when generator is connected in star. If $K_C = 1$ and $K_d = 0.966$. **(07 Marks)**

OR

8 a. In a three phase star connection, find the relation, find the relation between line and phase values of current and voltages. Also derive the equation for three phase power. **(07 Marks)**

b. Three identical coils, each having a resistance of 10 Ω and a reactance (inductive) of 10 Ω are connected in delta. Find the line current and readings on each of the wattmeters to measure the power. Supply voltage is 400 V, 3-phase. **(07 Marks)**

c. Derive the emf equation of the synchronous generator. **(06 Marks)**

Module-5

9 a. Explain construction and working of single phase transformer. **(08 Marks)**

b. A 4-pole, 50 Hz, 3-phase induction motor running with 1440 rpm on full load. Calculate slip of the machine and rotor frequency. **(05 Marks)**

c. A single phase transformer is rated 600/200 V, 25 KVA, 50 Hz. Calculate :

(i) The magnitude of primary and secondary current.

(ii) What would be the value of maximum core flux when the transformer is excited, given $N_1 = 60$ turns. **(07 Marks)**

OR

10 a. Define slip. Derive an expression for frequency of rotor current. **(06 Marks)**

b. Explain the concept of rotating magnetic fields in three phase induction motor. **(07 Marks)**

The efficiency of a 400 KVA, 1-phase transformer is 98.77% when delivering full load at 0.8 pf and 99.13% at half full load and unity p.f. Calculate Iron loss and full load Copper loss. **(07 Marks)**

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17ELN15/25

First/Second Semester B.E. Degree Examination, July/August 2022
Basic Electronics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the V-I characteristics of p-n junction diode. (08 Marks)

b. With neat circuit diagram and waveform explain the working of full wave bridge rectifier. (08 Marks)

c. Derive the relationship between α and β. Also calculate the α value and β value of a transistor. If $I_\beta = 100\mu A$ and $I_C = 2mA$. (04 Marks)

OR

2 a. With a neat diagram, explain the Input-Output characteristics of a transistor in common base configuration. (08 Marks)

b. With neat circuit diagram and waveforms, explain the working of a half-wave rectifier. (08 Marks)

c. Explain briefly capacitor filter circuit. (04 Marks)

Module-2

3 a. Explain the characteristic of Ideal operational amplifier. (06 Marks)

b. What is DC load line? Explain with neat circuit the operation of voltage divider bias circuit. (08 Marks)

c. Derive the output expression of Op-Amp differentiator. (06 Marks)

OR

4 a. Calculate the output voltage of a three input inverting summing amplifier, given $R_1 = 200K\Omega$, $R_2 = 250K\Omega$, $R_3 = 500K\Omega$, $R_f = 1M\Omega$, $V_1 = -2V$, $V_2 = -1V$ and $V_3 = +3V$. (06 Marks)

b. For the circuit shown in Fig.Q.4(b) find the Q-point values and draw DC-load line, where $V_{BE} = 0.7V$ and $\beta = 50$. (06 Marks)

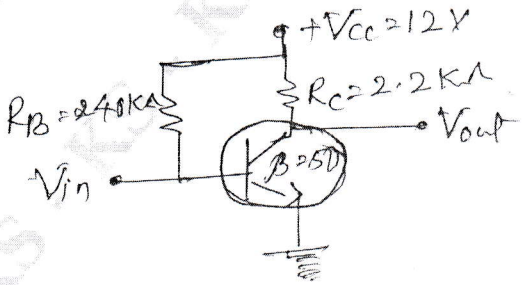

Fig.Q.4(b)

c. Explain briefly inverting and non-inverting operational amplifiers. (08 Marks)

Module-3

5 a. Convert:
i) $(1101101)_2 = (?)_{10}$ and $(101.01)_2 = (?)_{10}$
ii) $(48350)_{10} = (?)_{16} = (?)_8$
iii) $(FA876)_{16} = (?)_8 = (?)_{10}$
iv) $(237)_8 = (?)_{16} = (?)_{10}$. **(08 Marks)**

b. Perform the subtraction:
i) $(22 - 17)_{10}$ by using 1's complement.
ii) $(11010)_2 - (10000)_2$ by using 2's complement. **(04 Marks)**

c. State and prove De-Morgan's theorems. **(08 Marks)**

OR

6 a. Explain the full adder circuit with circuit diagram, truth table. **(05 Marks)**

b. What are universal gates? Realize AND and OR gates using NAND gates. **(05 Marks)**

c. Simplify: $y = \overline{A}\overline{B}\overline{C}D + \overline{A}\overline{B}C\overline{D} + A\overline{B}\overline{C}\overline{D} + A\overline{B}C\overline{D}$. **(05 Marks)**

d. Draw and explain half adder circuit. **(05 Marks)**

Module-4

7 a. Explain the operation of NOR Latch with symbol, circuit diagram and truth table. **(06 Marks)**

b. Explain with neat block diagram architecture of 8051 microcontroller. **(08 Marks)**

c. Explain the working of clocked RS-flip flop using NAND-gates. **(06 Marks)**

OR

8 a. Write a note on NAND-gate latch. **(06 Marks)**

b. With the help of block diagram, explain the microcontroller based stopper motor control system. **(08 Marks)**

c. Explain R-S flip-flop with diagram and truth table. **(06 Marks)**

Module-5

9 a. With the help of block diagram, explain the communication system. **(06 Marks)**

b. Define Modulation. Derive mathematical expression for amplitude modulation, draw waveforms. **(06 Marks)**

c. Explain the construction and working principle of LVDT. **(08 Marks)**

OR

10 a. A carrier of 1MHz, with 400W of its power is amplitude modulated with a sinusoidal signal of 2500Hz. The depth of modulation is 75%. Calculate the side band frequency, Bandwidth, the power in the side bands and the total power in the modulated wave. **(06 Marks)**

b. List the differences between Amplitude Modulation and frequency modulation. **(06 Marks)**

d. Explain the piezoelectric transducer and photo electric transducer. **(08 Marks)**

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