

- Q.1 (A) Discuss Taylor's series method of solving ordinary differential equation. Solve $y' = x + y, y(0) = 1$ from this method. Hence find the values of y at $x = 0.1$ and $x = 0.2$. [07]
- (B) Explain Runge-Kutta Method briefly of solving the ordinary differential equation. Using 4th order method of it to find an approximate value of y when $x = 0.2$ given that $\frac{dy}{dx} = x + y$ and $y = 1$ when $x = 0$. [07]

OR

- Q.1 (A) Describe the advantages and disadvantages of Euler's approach and its modified version for solving ordinary differential equations. [07]
- (B) Describe the Milne's method. Using this method, find $y(4.5)$ given by $5xy' + y^2 - 2 = 0$. Also, given $y(4.0) = 1, y(4.1) = 1.0049, y(4.2) = 1.0097, y(4.3) = 1.0143$ and $y(4.4) = 1.0187$. [07]
- Q.2 (A) Solve the equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over that square with sides $x = 0 = y, x = 3 = y$ with $u = 0$ on the boundary and mesh length = 1. [07]
- (B) Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown. [07]

	0	500	1000	500	0	0
1000		u_1	C	u_2	u_3	1000
2000	A	u_4		u_5	u_6	B
1000		u_7		u_8	u_9	1000
0						0
	0	500	1000	500	0	

OR

- Q.2 (A) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$ satisfying the initial condition: $u(x, y, 0) = \cos 2\pi x \cos 2\pi y, 0 \leq x, y \leq 1$ and conditions: $u(x, y, t) = 0, t > 0$ on the boundaries, using Alternating Direction Explicit (ADE) method with $h = \frac{1}{3}$ and $\alpha = \frac{1}{8}$. Calculate the results for one-time level. [07]
- (B) Explain briefly finite difference approximations to get 1st and 2nd order partial derivatives. [07]
- Q.3 (A) Draw the circuit diagram of Monostable multivibrator using IC-555 and explain the working of the circuit. [07]

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- (B) Draw the circuit diagram, truth table and waveforms of Mod-10 counter using IC-7490 in 2x5 configuration and explain the working of the circuit. [07]

OR

- Q.3 (A) Draw the circuit diagram for (i) 8-bit parity checker and (ii) 9 bit odd-parity generator. Explain their working. [07]
(B) Draw the circuit diagram of IC-54/7494 and explain its use as parallel in-parallel out shift register. [07]
- Q.4 (A) Explain the working of 4-bit *binary ladder* network drawing its circuit diagram. [07]
(B) Draw a circuit diagram of Sample and Hold Circuit for D/A converter and explain its working. [07]

OR

- Q.4 (A) Draw the circuit diagram of single ramp A/D converter and explain its working. [07]
(B) Discuss the working of Successive Approximation in the A/D converter drawing necessary block diagram. [07]
- Q.5 Answer in brief **Any Seven** questions from the following: (Each question is of two mark). [14]
- (i) Give appropriate examples to illustrate the step-by-step procedures for solving the differential equation.
 - (ii) Define predictor-corrector method. Give its expression.
 - (iii) Why is the Taylor's series method inferior than the Runge-Kutta method?
 - (iv) Classify the equation: $x^2 u_{xx} + y^2 u_{yy} = xu_x - yu_y$.
 - (v) What is limitation of Schmidt explicit formula?
 - (vi) Explain why the Gauss-Seidal method is computationally faster than the Jacobi's method.
 - (vii) In PROM design each **x** represents _____ and each solid black bullet represents _____.
 - (viii) How long will it take to shift an 8-bit number into a 54164 serial in parallel out shift register if the clock is set at 1 MHz?
 - A. 8 micro-second
 - B. 800 nano-second
 - C. 80 micro-second
 - D. 1 micro-second
 - (ix) A 16 bit input to a parity checker is 1111 1001 1011 0101. It's output will be _____.
 - (x) In simultaneous method of A/D conversion, _____ comparators are required to convert to a digital signal that has n bits.
 - (xi) Approximately how many bits are required at the input of a converter if it is necessary to resolve voltages to 5 mV and the ladder has +5 V full scale?
 - (xii) What is the resolution of a 8-bit *DIA* converter which uses a ladder network? What is this resolution expressed as a percentage?

*** PAPER ENDS ***