EXTC Sem III COLD) 20(11)5

AM-III

QP Code : **1078**

(3 Hours) [Total Marks : 100

N.B. : (1) Question no. 1 is **compulsory**
(2) Attempt **any four** questions out of the remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.

1. (a) Show that every square matrix can be uniquely expressed as the sum of Hermitian and Skew- Hermitian matrix. 5
(b) If $\{f(k)\} = 4^k$ for $k<0$; $\{f(k)\} = 3^k$ if $K \geq 0$ then find $Z\{f(k)\}$ 5
(c) Obtain complex form of fourier series for $f(x) = \cosh 3x + \sinh 3x$ in $(-3, 3)$ 5
(d) Find the Laplace Transformation of the function $\sqrt{1+\sin 2t}$ 5

2. (a) Find Laplace transform of $\frac{\cos at - \cos bt}{t}$ 6

(b) Reduce $A = \begin{bmatrix} 1 & -1 & -2 & -3 \\ 4 & 1 & 0 & 2 \\ 0 & -3 & 1 & 4 \\ 0 & 1 & 0 & 2 \end{bmatrix}$ in to normal form hence find rank of A 6

(c) Find the Fourier expansion for $f(x) = x\sin(x)$ in $(0, 2\pi)$ 8

3. (a) Test for consistency and solve 6
$2x - y + z = 9, 3x - y + z = 6, 4x - y + 2z = 6, -x + y - z = 4$

(b) Find the Half Range Sine series for $f(x) = x \sin x$ in $(0, \pi)$ 6

(c) Find inverse z-transform of $f(z) = \frac{3z^2 - 18z + 26}{(z-2)(z-3)(z-4)}, 2 < z < 4$ 8

4. (a) Find z- transform of $2^k \cos(3k + 2)$, $k \geq 0$ 6

(b) Find the Fourier expansion for $f(x) = \sqrt{1-\cos(x)}$ in $(0, 2\pi)$ 6

(c) Solve Using Laplace transform $\frac{d^2y}{dt^2} - \frac{dy}{dt} - 2y = 20 \sin 2t$ where 8
$y(0) = 1, y'(0) = 2$

[TURN OVER]

5. (a) Find fourier integral representation for 6

$f(x) = x , 0 < x < a$

$= 0, x > a$

(b) Find the two non -singular matrices P and Q such that PAQ 6

is in normal form where $A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & -1 \end{bmatrix}$ and also find its rank.

(c) Obtain fourier series for $f(x) = x(\pi - x)\ 0 < x < \pi$ as a half range cosine series and 8

hence show that $\sum_{n=1}^{\infty} \frac{1}{n^4} = \frac{\pi^4}{90}$

6. (a) Using Laplace transform evaluate $\int_0^{\infty} (1 + 2t - 3t^2 + 4t^3) H(t-2) dt$ 6

(b) Show that the set of functions $\sin(2n+1)x$, $n = 0, 1, 2, \ldots$ is orthogonal 6

Over $\left[0, \frac{\pi}{2}\right]$ Hence construct orthonormal set of functions.

(c) Find inverse Laplace transforn of the following 8

$$(i) \frac{1}{s}\log\left(1 + \frac{1}{s^2}\right) \quad (ii) \frac{e^{4-3s}}{(s+4)^{5/2}}$$

7. (a) Find inverse Laplace transform of $\frac{(s+2)^2}{(s^2+4s+8)^2}$ by convolution theorem 6

(b) If $N = \begin{bmatrix} 0 & 1+2i \\ -1+2i & 0 \end{bmatrix}$ then show that $(I - N)(I+N)^{-1}$ is a unitary matrix 6

(c) Obtain fourier series for $f(x) = \begin{cases} 1 + \frac{2x}{\pi} & -\pi \le x \le 0 \\ 1 - \frac{2x}{\pi} & -0 \le x \le \pi \end{cases}$ 8

Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots$

BE EXTC Old
EDC-1
Sem - II
27/11/15

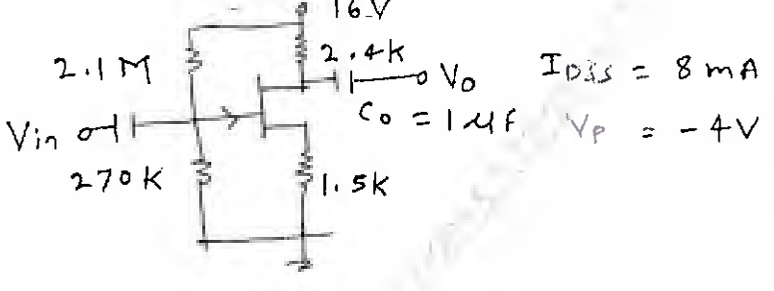
Q.P. Code : **1121**

(Old Course)
(3 Hours) [Total Marks : 100

N.B. : (1) Question **No.1** is **compulsory.**
(2) **Attempt** any **four** questions from the remaining **six** questions.
(3) **Figure** to the **right** indicates **full marks.**
(4) Assume **suitable** data whenever **necessary** and **mention the same.**

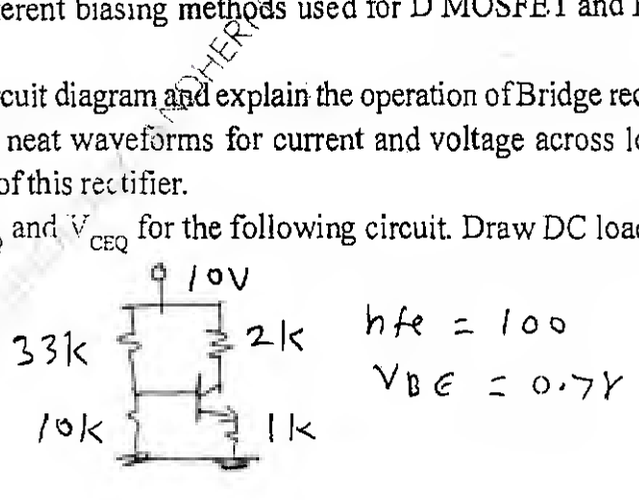
1. Using BC 147 A transistor design single stage RC coupled BJT amplifer for following specifications Av = 100, V_0 = 3 Volts, f_L – 10 H_z, S < 10. For the designed amplifier determine input and output impedances ,voltage gain. State any two applications of this amplifier. **20**

2. (a) Derive the expressions of voltage gain ,input impedance, output impedance for CS amplifier using JFET. **10**
(b) Determine V_{GS}, V_{DS}, I_D for the amplifier shown below : **10**



3. (a) Derive the expressions of Voltage gain, current gain ,input impedance and output impedance for CB AMPLIFIER. **10**
(b) Explain different biasing methods used for D MOSFET and E MOSFET. **10**

4. (a) Draw the circuit diagram and explain the operation of Bridge rectifier with capacitor filter. Draw neat waveforms for current and voltage across load and diode. State application of this rectifier. **10**
(b) Find I_{BQ}, I_{CQ} and V_{CEQ} for the following circuit. Draw DC load line. **10**



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QP-Con. 8384-15.

5. Design CS amplifier for the following specifications : 18
$A_v = 10$, $Z_{in} = 1M$ ohms, $V_o = 2$ Volts, $F_L = 10$ Hz
State applications of this amplifier. 2

6. Write short notes on the following :
(a) BJT as a switch,
(b) Thermal runaway,
(c) S.C.R.,
(d) Zener diode.

7. (1) Draw and explain hybrid π model of BJT. 5
(2) Explain biasing of FET for zero temperature drift. 5
(3) Explain the operation of BJT shunt voltage regulator. 5
(4) Compare different types of filters. 5

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Transistor type	$P_{c(max)}$ @ 25°C Watts	$I_{c(max)}$ @ 25°C Amps.	$V_{CE(sat)}$ volts d.c.	V_{ceo} volts d.c.	V_{ceo} (Sus) volts d.c.	V_{cex} (Sus) volts d.c.	V_{cex} volts d.c.	V_{eco} volts d.c.	T_j max. °C	D.C. current gain min	D.C. current gain typ.	D.C. current gain max.	Small Signal min.	Signal typ.	h_{fe} max.	V_{BE} max.	θ_{ja} °C/W	Derate above 25°C W/°C
2N 3055	115.5	15.0	1.1	100	60	70	90	7	200	20	50	70	15	50	120	1.8	1.5	0.7
ECN 055	50.0	5.0	1.0	60	50	55	60	5	200	25	50	100	25	75	125	1.5	3.5	0.4
ECN 149	30.0	4.0	1.0	50	40	–	–	8	150	30	50	110	33	60	115	1.2	4.0	0.3
ECN 100	5.0	0.7	0.6	70	60	65	–	6	200	50	90	260	50	90	280	0.9	35	0.05
BC 147A	.0.25	0.1	0.25	50	45	50	–	6	125	115	180	220	125	220	260	0.8	–	–
2N 525 (PNP)	0.225	0.5	0.25	85	30	–	–	–	100	35	–	65	–	45	–	–	–	–
BC 147 B	0.25	0.1	0.25	50	45	50	–	6	125	200	290	450	240	330	500	0.9	–	–

Transistor type	h_{ie}	h_{oe}	h_{re}	θ_{ja}
BC 147 A	2.7kΩ	18μmho	1.5×10^{-4}	0.4°C/mW
2N 525 (PNP)	1.4kΩ	25μmho	3.2×10^{-4}	—
BC 147B	4.5kΩ	30μmho	2×10^{-4}	0.4°C/mW
ECN 100	50Ω	–	—	—
ECN 149	15Ω	–	—	—
ECN 055	12Ω	–	—	—
2N 3055	6 Ω	–	—	—

BFW 11-JFET MUTUAL CHARACTERISTICS

$-V_{GS}$ volts	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.6	2.0	2.4	2.5	3.0	3.5	4.0
I_{DS} max. mA	10	9.0	8.3	7.6	6.8	6.1	5.4	4.2	3.1	2.2	2.0	1.1	0.5	0.0
I_{DS} typ. mA	7.0	6.3	5.4	4.6	4.0	3.3	2.7	1.7	0.8	0.2	0.0	0.0	0.0	0.0
I_{DS} min.mA	4.0	3.3	2.2	1.6	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

N-Channel JFET

Type	$V_{DS\,max.}$ Volts	$V_{DG\,max.}$ Volts	$V_{GS\,max.}$ Volts	$P_{d\,max.}$ @ 25°C	$T_{j\,max.}$	I_{DSS}	g_{os} (typical)	$-V_p$ Volts	r_d	Derate above 25°C	θ_{ja}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μ mho	6	50 KΩ	2 mW/°C	0.58°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5800 μ mho	2.5	80 KΩ	—	0.58°C/mW

S.E. EXTC sem III (old)

3/12/15

DLD

QP Code : 1163

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**
(2) Solve **any four** out of remaining **six** questions
(3) Each question carries **20 marks.** Equal marks for the subquestions.
(4) Assume suitable data if required.

1. (a) Obtain Gray code and Excess-3 code for $(9599)_{10}$
   (b) Obtain equivalant Binary, octal, Hexadecimal nos. for $(8588)_{10}$
   (c) Do the followings using 2'S complement method
      (i) $(54)_{10} - (45)_{10}$
      (ii) $(56)_{10} - (65)_{10}$
   (d) Design 2-I/P AND operation using 2-I/P NOR gates only

2. (a) State and prove Demorgan's theorems.
   (b) Design the logic ckt for following logical eq^n using NAND gates only.
   $$Y = (A + \overline{B}).(A + \overline{B} + C)$$

3. (a) Design the logic ckt for Full Adder using logic gates.
   (b) Minimize the following logical eqn using k-map & design the minimized eq^n using logic gates.
   $$Y = \sum m\,(1,3,7,11,15) + d(0,2,5)$$

4. (a) Design and Explain the logic ckt for 4:1 MUX using logic gates.
   (b) Design the logic ckt for Full ADDER using only one 3:8 Decoder (use some necessary gates if required)

5. (a) Explain the following terms related to flipflops
      (i) Set (ii) Reset
      (iii) Preset (iv) Clear
   (b) Design the logic ckt for conversion of T-FF into D-FF

6. (a) Design and explain the logic ckt for 3-bit synchronous counter using MS-JK FFs
   (b) Design and explain the logic ckt for 3-bit SISO register (With O/p waveforms) using MS-JK FFs.

7. Write short notes on any four :-
   (i) Weighted and Non-weighted codes
   (ii) Asynchronous counter
   (iii) ECL Logic family
   (iv) PAL & PLA
   (V) Quine Mc-cluskey method.

QP-Con. 9647-15.

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SE - SEM III (R-2007) EXTC (OLD) Dec 2015

Electrical Networks

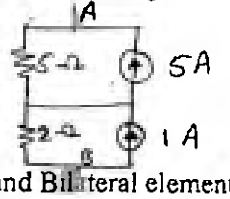
(OLD COURSE)
(3 Hours)

QP Code: **1264**
[Total Marks: 100]

N.B. : (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** from the **remaining** questions.
(3) **Assume** suitable **data**, if **required.**

Q.1 Attempt any four (20)

(1) Using source transformation, replace the network with a single current source and a resistor.



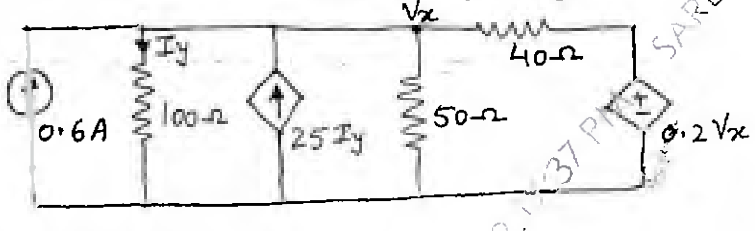
(2) Define Unilateral and Bilateral element.

(3) Define final steady state condition for resistor and capacitor.

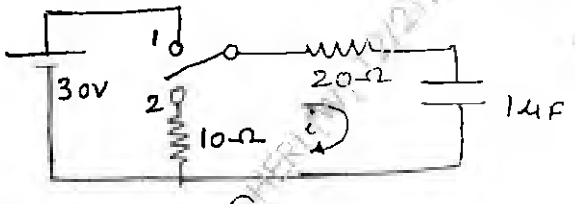
(4) Obtain condition for reciprocity for Z parameters.

(5) Draw pole zero plot for = $S(S+1)/(S+3)(S+2)^2$

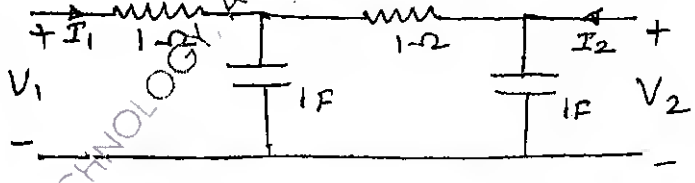
Q. 2 (a) Using nodal analysis calculate current I_y in the given network (10)



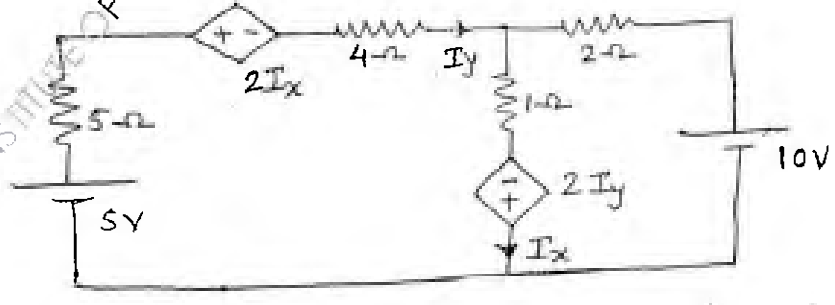
(b) In the given network switch initially is at position 1, and attains steady state condition. At t = 0, it is moved from position 1 to position 2. find the value of (i, d_i/d_t and d^2_i/d_t^2) at t > 0^+. (10)



Q. 3 (a) Find the network functions V_1/I_1, V_2/I_1, and V_2/V_1. (10)



(b) Calculate I_x and I_y for the given network (10)



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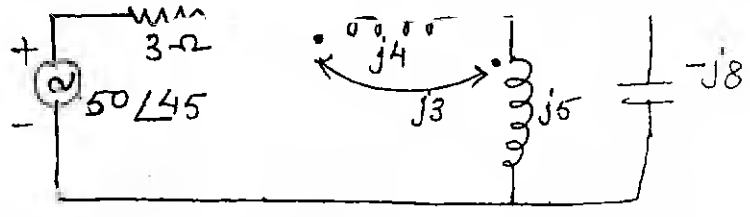
Q.4 (a)) Find the current through 3ohm resistor. (10)

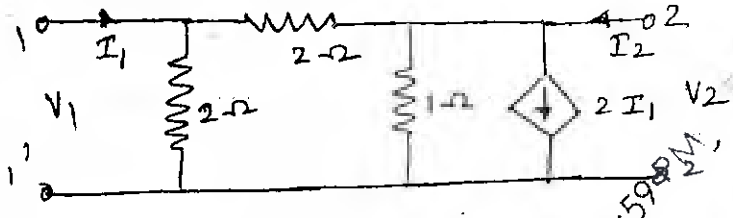


(b) Realise the function using Cauer I and Cauer II (10)
$Z(s) = (10S^4 + 12S^2 + 1) / (2S^3 + 2S)$

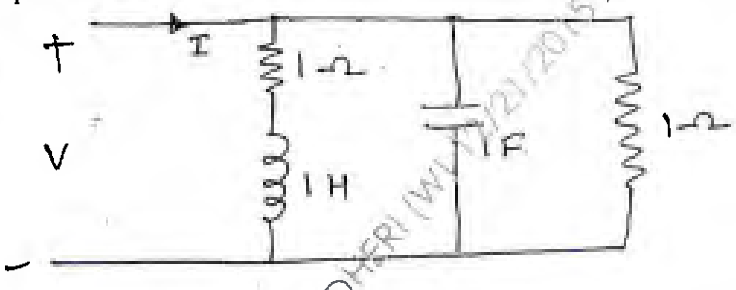
Q. 5(a) Test the function is PRF or not (05)
$F(s) = (S^3 + 6S^2 + 7S + 3) / (S^2 + 2S + 1)$

(b) Test whether the polynomials are Hurwitz or (05)
(1) $P(s) = 2S^4 + 5S^3 + 5S^2 + 4S + 10$
(2) $P(s) = S^5 + S^3 + S$

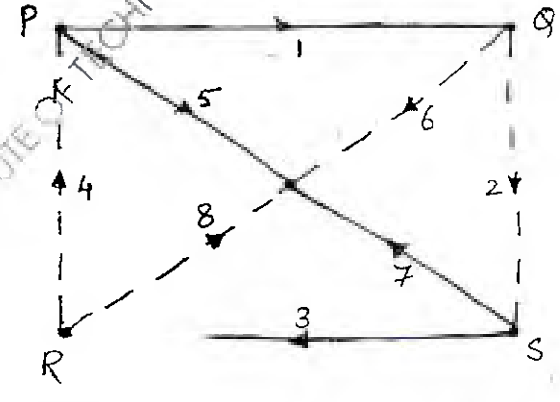
(c) Find h parameters for the given network (10)



Q.6 (a) Find the driving point admittance Y(s) for the network shown and plot the pole-zero plot. (10)



(b) For the given tree obtain (10)
(1) Incidence matrix
(2) Fundamental cutset matrix
(3) Fundamental tieset matrix



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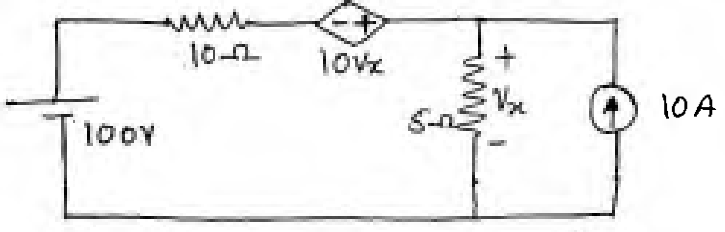
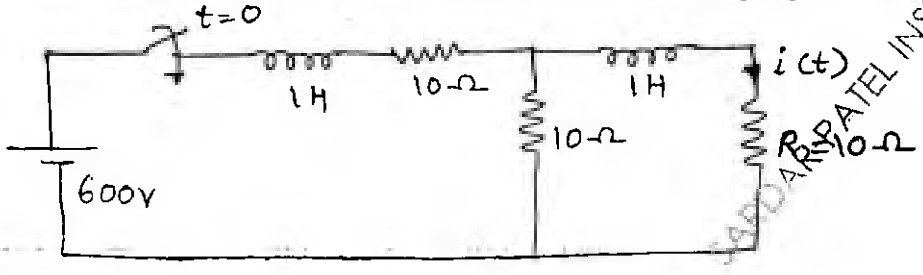
QP Code : 1264

Q.7(a) Find the current in 10 ohm resistor of the network, using thevenin's theorem. (10)



(b) Find the current i(t) through R in the circuit shown below using Laplace transform. (10)



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S. E. Sem III (EXTC – OTR). 16/12/15

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Q.P. Code : 1219

(OLD COURSE)

(3 Hours) Total Marks : 100

N.B. (1) Question No. 1 is **compulsory.**
(2) Attempt any **four** out of remaining **six** questions.
(3) Make **suitable** assumptions if **required** and **justify** the **same.**

1. (a) Volume of a certain solid V is calculated using formula $V = 64\frac{xy^4}{z^2}$ where x, y & z denote three dimensions. If maximum possible errors in the x, y & z is limited to plus minus 0.001.Estimate the maximum probable error in the calculation of volume if the normal dimension x, y & z are equal to unity. 5

(b) Define the operators $\Delta, \nabla, \delta, \mu$ & E. Prove that 5

i) $2\mu\delta - \Delta + \nabla$ ii) $E = 1 + \Delta$

(c) Using Picard's method solve 5

$\frac{dy}{dx} = 1 + xy$ such that $y = 0$ when $x = 0$.

(d) Derive the equation for Regula – falsi method using geometrical interpretation. 5

2. (a) List the bracketing methods and open methods and find the real root of the equation $xe^x - \cos x = 0$ using Newton-Raphson method correct to three decimal places. 10

(b) Solve the following equations by Gauss - Seidel method. 10
$27x + 6y - z = 85$, $6x + 15y + 2z = 72$, $x + y + 54z = 110$.

3. (a) From the following table find the number of students who obtained marks less than 45. 10

Marks	30-40	40-50	50-60	60-70
No. of students	31	42	51	35

(b) Using Newton's divided difference formula, find the value of f(9) from the following table. 10

x	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

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4. (a) Write a program for Lagrange's interpolation method and using this formula, find the value of y when $x = 10$ from the following table. 10

x	5	6	9	11
y	12	13	14	16

(b) Fit a second degree parabola to the following data: 10

x	2	4	5	6	8	11
y	18	12	10	8	7	5

5. (a) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Trapezoidal, Simpson's $\frac{1}{3}^{rd}$ and Simpson's $\frac{3}{8}^{th}$ rule. 10

(b) Solve $\frac{dy}{dx} = x^2 + y$ with $x_0 = 0$, $y_0 = 1$ by Euler's modified formula find the value of y when $x = 0.5$ taking $h = 0.25$. 10

6. (a) Solve $\frac{dy}{dx} = x + y^2$ with initial conditions $y(1) = 1.5$ and find y at $x = 1.2$, $x = 1.4$ by Runge - Kutta Method of Fourth Order taking $h = 0.2$. 10

(b) Solve the following set of equations using Gauss Elimination method. 10

$2x + y + z = 10$, $3x + 2y + 3z = 18$, $x + 4y + 9z = 16$.

7. (a) Explain the propagation of errors. 5

(b) Using Adams – Bashforth method, obtain the solution of $\frac{dy}{dx} = x - y^2$ at $y(0.8)$, given values 10

x	0	0.2	0.4	0.6
y	0	0.0200	0.0795	0.1762

(c) Write a short note on Golden section search. 5

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