Heaven's Light Is Our Guide

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

2nd Year Odd Semester Examination 2020

COURSE NO: **EEE 2151** COURSE TITLE: **Analog Electronics**

FULL MARKS: 72 TIME: 3 HRS

N.B. (i) Answer any **SIX** questions taking any **THREE** from each section.
(ii) Figures in the right margin indicate full marks.
(iii) Use separate answer script for each section.

SECTION : A

Marks

Q.1. (a) Write down the name of diode equivalent models and draw their characteristics curve. 3

(b) What is zener diode? Explain how does zener diode maintain constant voltage across the load? 4

(c) How can you test a diode in laboratory using ohmmeter? 3

(d) Why silicon is preferred to Germanium for manufacturing electronic components. 2

Q.2. (a) Show that average value and output voltage for full wave rectifier circuit is twice than that of half wave rectifier. 4

(b) Determine the value of V_0, I_1, and I_2 of Fig. 2(b) 4

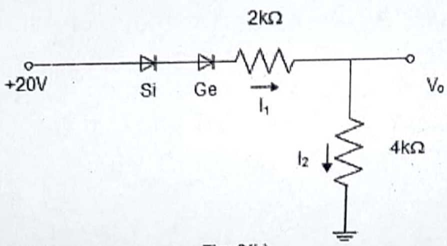

Fig. 2(b)

(c) Draw a voltage divider bias circuit and derive the expression for I_B. 4

Q.3. (a) Why BJT is called bipolar? Write down three operating regions of transistor and mention their biasing conditions. 4

(b) For the following emitter bias network determine i) I_c, ii) V_c, iii) V_{BC}, and iv) V_E. 4

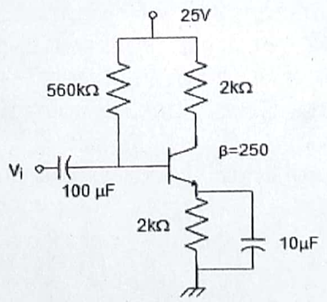

Fig. 3(b)

(c) Determine R_B and R_C for the transistor inverter of Fig. 3(c) if $I_{C_{sat}} = 10mA$. 4

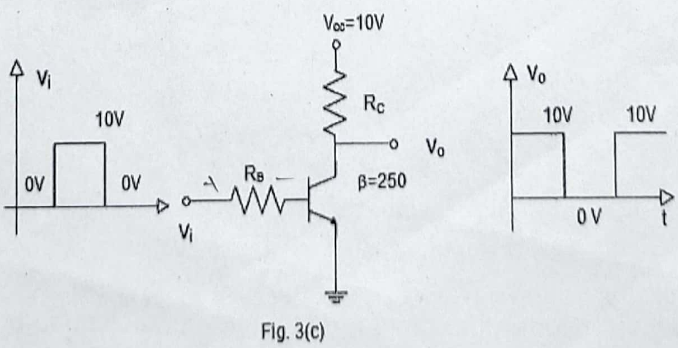

Fig. 3(c)

Q.4. (a) For emitter-follower configuration, show that output voltage and input voltage are in phase. Draw r_e equivalent circuit if necessary. 4

(b) Write down the ideal characteristics of Op-Amp and also draw the transfer characteristics. 4

(c) Calculate V_0 in the circuit shown in Fig. 4(c). Also draw input output wave shapes. 4

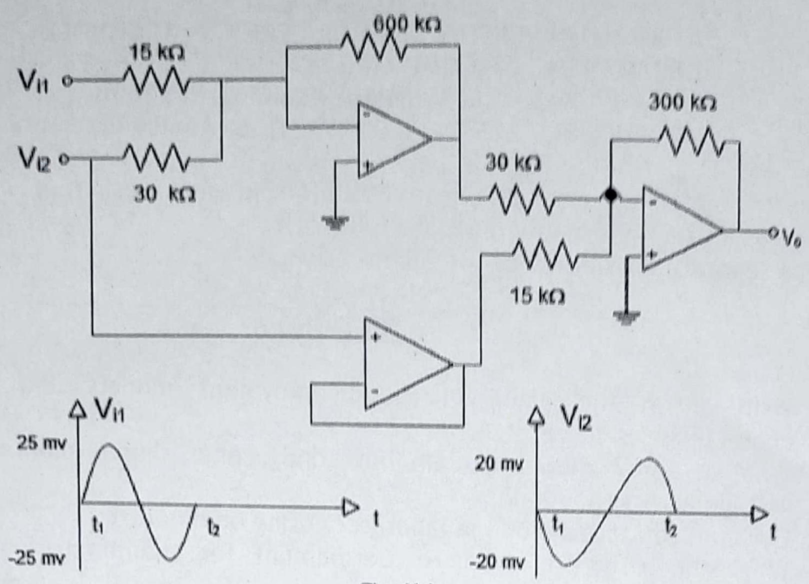

Fig. 4(c)

SECTION : B

Q.5. (a) Draw a band pass filter and derive the expression for cutoff frequencies and center frequency. 4

(b) Determine what type of filter is shown in Fig. 5(b). Calculate the corner frequency. Take $R = 2k\Omega$, $L = 2H$ and $C = 2\mu F$. 4

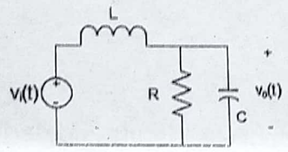

Fig. 5(b)

(c) Design a wide band pass filter using Op-Amp with f_L=200 Hz, f_H=1 kHz and a pass band gain=4. Also draw the frequency response plot of this filter. 4

Q.6. (a) Draw a Schmitt trigger circuit and explain how the effect of noise can be eliminated using Schmitt trigger circuit. 4

(b) What is feedback? "Positive feedback is given for oscillator circuits while negative feedback is used for amplifiers"- explain the statement. 4

(c) With a proper circuit describe the operation of 555 timer as a monostable multivibrator. 4

Q.7. (a) Determine the frequency and draw the output waveform for the circuit of Fig. 7(a). 4

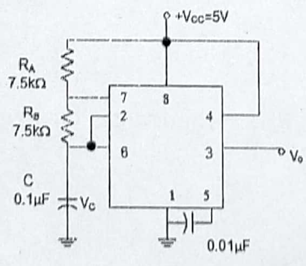

Fig. 7(a)

(b) Explain the operation of tank circuit. 3

(c) Draw a phase shift oscillator and prove that the oscillation frequency, $f = \frac{1}{2\pi RC\sqrt{6}}$ and the gain must be at least 29. 5

Q.8. (a) Design a square wave generator using 555 timer. Explain the circuit operation with proper diagram. In addition, determine the duty cycle. 5

(b) Differetiate between an alternator and oscillator. 3

(c) Define comparator. Illustrate the effect of noise on comparator circuit. 4

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

2nd Year Odd Semester Examination 2020

COURSE NO: **CSE 2101** COURSE TITLE: **Discrete Mathematics**

FULL MARKS: 72 TIME: 3 HRS

N.B. (i) Answer any **SIX** questions taking any **THREE** from each section.
(ii) Figures in the right margin indicate full marks.
(iii) Use separate answer script for each section.

SECTION : A

Marks

Q.1. (a) How many rows appear in a truth table for each of these compound propositions- 2

i) $(p \to r) \lor (\neg s \to \neg t) \lor (\neg u \to \neg v)$

ii) $(p \land r \land s) \lor (q \land t) \lor (r \land \neg t)$

(b) Write the following sentences using propositional variables and logical connectives: 4

i) Experience with c++ or java is required.

ii) When you buy a new motorcycle from ACI Motors, you get $200 back in cash or a 2% bank loan.

iii) Willy gets caught whenever he cheats.

iv) The trains run late on exactly those days when I take it.

(c) Determine the truth value of each of these statements if the domain consists of all real numbers for each variable. 3

i) $\exists_x \forall_y (xy = 0)$, ii) $\forall_x \forall_y \exists_z (z = (x+y)/2)$, iii) $\forall_x (x \neq 0 \to \exists_y (xy = 1))$

(d) Prove that $\sqrt{3}$ is irrational by giving a proof by contradiction. 3

Q.2. (a) Use set builder notation and logical equivalences to establish the first De Morgan law $\overline{A \cap B} = \bar{A} \cup \bar{B}$. 3

(b) Let A={1,2,3,4,5} and B={0,3,6}. Find the followings- 3

i) $A \cap B$, ii) $B - A$, iii) $A - B$

(c) Find the inverse function of $f(x) = x^3 - 1$ and comment if its onto or not. 3

(d) Find the value of each of these sums- 3

i) $\sum_{j=0}^{8}(2^{j+1} - 2^j)$, ii) $\sum_{i=0}^{2}\sum_{j=0}^{3}(2i + 3j)$, iii) $\sum_{i=0}^{3}\sum_{j=0}^{3}(-1)^{2i-j}$

Q.3. (a) How many transitive relations are there on a set with n element if 3

i) $n = 1$? ii) $n = 2$? iii) $n = 3$?

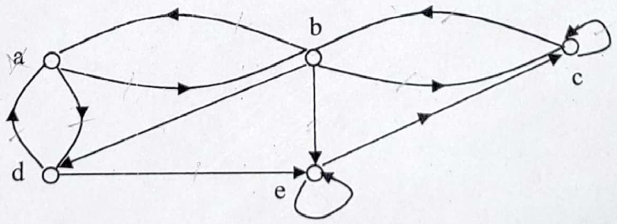
(b) Let R be the relation represented by the matrix 3

$$M_R = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$$

Find the matrix representing, i) R^{-1} ii) $\bar{R}$ iii) R^2

(c) What is bipartite graph? Give two examples. 3

(d) Represent the following graph using i) adjacency list & ii) adjacency matrix 3



Q.4. (a) Find the larger permutation in lexicographic order alter each of these permutation- 4

i) 45321 ii) 1623547, iii) 31528764, iv) 13245

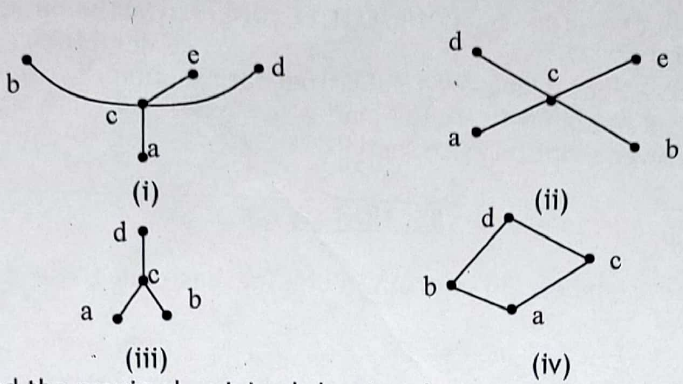
(b) Find the solution of the recurrence relation $a_n = -3a_{n-1} - 3a_{n-2} - a_{n-3}$, with $a_0 = 5$, $a_1 = -9$, $a_2 = 15$. 4

(c) Suppose that $f(n) = 2f\left(\frac{n}{2}\right) + 3$ when n is an even positive integer and $f(1) = 5$. Find: i) $f(2)$, ii) $f(8)$, iii) $f(64)$, iv) $f(1024)$ 4

SECTION : B

Q.5. (a) Define the following terms: i) Reflexive relation, ii) Symmetric relation, iii) anti-symmetric relation, and iv) transitive relation. 4

(b) What is partial ordering relation? Draw the Hasse diagram representing the partial ordering {(a,b)|a divides b} on {1,2,3,4,6,8,12}. 4

(c)  4

Find the maximal, minimal, least and greatest element of the above Hasse diagram.

Q.6. (a) Define i) theorem, ii) Corollary, iii) Conjecture. 3

(b) Give a contra position proof that if $n = ab$, where a and b are positive integers then $a \leq \sqrt{n}$ ~~and~~ or $b \leq \sqrt{n}$. 3

(c) Prove that if n is an integer then $n^2 \geq n$ by giving proof by cases. 3

(d) Verify the $3x + 1$ conjecture for 131. 3

Q.7. (a) Give a big-O estimate for $f(x) = (x + 1)\log(x^2 + 1) + 3x^2$ 4

(b) Let m be the positive integer. If $a \equiv b(mod\ m)$ and $c \equiv d(mod\ m)$, then prove that $a + c \equiv b + d(mod\ m)$ and $ac \equiv bd(mod\ m)$. 4

(c) Find the $3644\ mod\ 645$ using modular Exponentiation algorithm which uses $O((\log m)^2 \log n)$ bit operations to find $b^n\ mod\ m$. 4

Q.8. (a) State the Euler's formula and prove it. 6

(b) Describe the necessity and sufficient conditions for euler circuits and paths. 4

(c) State the four color theorem. 2

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

2nd Year Odd Semester Examination 2020

COURSE NO: **Hum 2113** COURSE TITLE: **Industrial Management and Accountancy**

FULL MARKS: 72 TIME: 3 HRS

N.B. (i) Answer any **SIX** questions taking any **THREE** from each section.
(ii) Figures in the right margin indicate full marks.
(iii) Use separate answer script for each section.

SECTION : A

			Marks
Q.1.	(a)	Define Management, efficiency, and effectiveness.	4
	(b)	What is scientific Management? State the principles of scientific management.	4
	(c)	What is controlling? Discuss the steps of controlling with relevant example.	4
Q.2.	(a)	What is employee motivation? Why is it important?	4
	(b)	Briefly state the expectancy Theory of Motivation.	4
	(c)	What is performance appraisal? Explain the potential rating scale appraisal problems.	4
Q.3.	(a)	What is meant by Inventory management?	2
	(b)	Dell computer begins a review of ordering policies for its continuous review systems by checking the current policies for a sample of items. Following are the characteristics of one item. Demand is 16500 units/week. Ordering and setup costs are \$35000/order or setup. Holding costs are \$45/unit/year. Lead time is 2 weeks. Standard deviation of weekly demand is 180 units. Cycle service level is 92 percent, which corresponds to Z-value 1.42. (i) What is EOQ for the item? (ii) What is ROP for the item? (iii) If an hand inventory is 600 units, there is an order placed equal to EOQ, and there is 400 units backorder. Is it time to place a new order? (iv) What will be the cost implication if Q=20000 units? (v) Show the situation on a continuous review chart.	10
Q.4.	(a)	What is plant layout? Mention and explain its types.	4
	(b)	What factors should be taken into account in determining efficient plant layout?	3
	(c)	Write short notes on: Decision making, Unity of command, Delegation of Authority, Span of management.	5

SECTION : B

Q.5.	(a)	What is Accounting? Discuss the basic assumptions in Accounting.	4
	(b)	Discuss the role of accounting in modern life.	3
	(c)	Distinguish between transaction and event.	3
	(d)	What is meant by asset?	2
Q.6.	(a)	Define (i) Works cost, (ii) Direct and indirect cost, (iii) Fixed and variable cost, and (iv) cost statement.	6
	(b)	Cost analysis of Electro ltd. showed that cost of D.materials was Tk 800,000 and direct labour costs accounted for 60% of prime cost. Factory overhead was applied at 75% of direct labour cost. During the period 29,000 units were produced of which 20000 units were sold @ Tk 2000 per unit. Administrative and selling expenses were Tk 3,25,000 and Tk 200,000 respectively. Prepare a cost statement showing total cost of goods sold and net profit.	6
Q.7.	(a)	Define Break Even Point (BEP).	2
	(b)	How do increase of sales price and decrease of variable cost reflect on BEP? Explain with example.	4

(c) The following information is obtained from the cost records of Alfa computers ltd: 6

Sales 2500 units @ Tk 200 per unit,
Fixed costs Tk 80,000
CM Ratio 40%. Required:

i) CM per unit & Variable cost per unit.
ii) Break even point.
iii) Profit if sales are 3500 unit.
iv) Calculate BEP if selling price is increased by 10%.

Q.8. From the following Trial Balance prepare a Trading Account and Profit & Loss Account for the year ended 31st December 2020 and a Balance Sheet as on that date: 12

Dr Trail Balance Cr

Particulars	Amount	Particulars	Amount
Purchases-	5,00,000	Sales	7,70,000
Wages-	10,000	Sundry Creditors	60,000
Carriage in-	25,000	Bank Overdraft	60,000
Carriage out-	15,000	Discount	5000
Return in-	15,000	Purchase return	15,000
Opening stock-	1,00,000	Capital/Owner's Equity	6,00,000
Bad debts-	5,000		
Salaries-	25,000		
Advertisement-	25,000		
Machineries-	2,00,000		
Stationery-	20,000		
Cash at Bank-	25,000		
Rent	8,000		
Insurance	12,000		
Land & Buildings-	3,00,000		
S/Debtors-	1,20,000		
Discount-	3,000		
Commission-	7,000		
Furniture	95,000		
	15,10,000	Total	15,10,000

Adjustments:

i) Closing stock was valued at Tk. 3,75,000.
ii) Depreciate furniture by 15% and building by 10%..
iii) Rent outstanding Tk. 5000 and advertisement prepaid Tk 10,000.

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2nd Year Odd Semester Examination 2020

COURSE NO: **Math 2113** COURSE TITLE: **Vector Analysis and Linear Algebra**

FULL MARKS: 72 TIME: 3 HRS

N.B. (i) Answer any **SIX** questions taking any **THREE** from each section.
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(iii) Use separate answer script for each section.

SECTION A

Marks

Q.1. (a) Discuss linearly dependence and independence of a set of vectors. Are the vectors $\vec{r_1} = 2\hat{\imath} - 3\hat{\jmath} + \hat{k}$, $\vec{r_2} = 3\hat{\imath} - 5\hat{\jmath} + 2\hat{k}$ and $\vec{r_3} = 4\hat{\imath} - 5\hat{\jmath} + \hat{k}$ linearly independent? If not find a dependence relation between them. 06

(b) Show that $\frac{1}{6}\vec{A}\,.(\vec{B} \times \vec{C})$ is an absolute value equal to the volume of a tetrahedron with sides $\vec{A}$, $\vec{B}$ and $\vec{C}$. 03

(c) If $\vec{A} = 2\hat{\imath} + \hat{\jmath} - 3\hat{k}$ and $\vec{B} = \hat{\imath} - 2\hat{\jmath} + \hat{k}$, find a vector of magnitude 5 perpendicular to both $\vec{A}$ and $\vec{B}$. 03

Q.2. (a) Given the space curve $x = t$, $y = t^2$, $z = 2/3\ t^3$, find (i) the curvature k and (ii) the torsion τ. 06

(b) If a particle has velocity $\vec{v}$ and acceleration $\vec{a}$ along a space curve, prove that the radius of curvature of its path is given by $\varrho = \frac{v^3}{|\vec{v} \times \vec{a}|}$. 06

Q.3. (a) Find the unit tangent vector to any point on the curve $x = t^2 + 1$, $y = 4t - 3$, $z = 2t^2 - 6t$ at the point where $t = 2$. 04

(b) Find the equations for the tangent plane and normal line to the surface $4z = x^2 - y^2$ at the point (3, 1, 2). 04

(c) Show that If $\vec{E} = \frac{\vec{r}}{r^2}$ is irrotational. Find φ such that If $\vec{E} = -\vec{\nabla}\varphi$ and such that $\varphi(a) = 0$ where $a > 0$. 04

Q.4. (a) State and prove divergence theorem. 06

(b) Verify divergence theorem for $\vec{A} = 4x\hat{\imath} - 2y^2\hat{\jmath} + z^2\hat{k}$ taken over the region bounded by $x^2 + y^2 = 4$, $z = 0$ and $z = 3$. 06

SECTION B

Q.5. (a) Define symmetric and skew-symmetric matrix with example. Show that every square matrix can be expressed uniquely as the sum of a symmetric and a skew-symmetric matrix. 06

(b) Find the rank and normal form of the matrix $A = \begin{pmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{pmatrix}$. Also determine the inverse of the matrix A. 06

Q.6. (a) Solve the following system of equations by matrix method. $x + 2y + z = 2$, $3x + y - 2z = 1$, $4x - 3y - z = 3$, $2x + 4y + 2z = 4$. 06

(b) Investigate for what values of λ and μ the following system equations have (i) no solution (ii) unique solution and (iii) infinite number of solutions. $x + y + z = 6$, $x + 2y + 3z = 8$, $x + 2y + \lambda z = \mu$. 06

Q.7. (a) Find the eigen values and corresponding eigen vectors of the matix. 06

$$A = \begin{pmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{pmatrix}.$$

(b) Solve the system of differential equations by matix method. 06
$dx/dt = 4x - y$ and $dy/dt = x + 2y$.

Q.8. (a) Find the dimension and a basis of the solution space w of the following system. 06
$x + 2y - s + 3t = 0$, $x + 2y + 2z + s + t = 0$, $3x + 6y + 8z + s + 5t = 0$.

(b) Consider the subspace U = span (u_1, u_2, u_3) and w = span (w_1, w_2, w_3) of $\mathbb{R}^3$ where $u_1 = (1, 1, -1)$, $u_2 = (2, 3, -1)$, $u_3 = (3, 1, -5)$, $w_1 = (1, -1, -3)$, $w_2 = (3, -2, -8)$, $w_3 = (2, 1, -3)$. Show that dim u = dim w = 2. 06

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2nd Year Odd Semester Examination 2020

COURSE NO: **CSE 2103** COURSE TITLE: **Numerical Methods**

FULL MARKS: 72 TIME: 3 HRS

N.B. (i) Answer any **SIX** questions taking any **THREE** from each section.
(ii) Figures in the right margin indicate full marks.
(iii) Use separate answer script for each section.

SECTION A

Marks

Q.1. (a) State the following terms with suitable examples: (i) Exact and approximate numbers and (ii) Significant digits/figures. 03

(b) Define truncation error and round-off error with suitable examples. Compute the absolute error and relative error for: sum $=\sqrt{3}+\sqrt[3]{28}+\sqrt{31}$. 04

$\frac{25xy^4}{z^2}$

(c) If $M=\frac{25xy^4}{zy^2}$; Calculate the relation error at X = Y = Z = 1 when error of X, Y, Z is 0.005. 03

(d) Define algebraic and transcendental equations. 02

Q.2. (a) State and prove the method of false-position. 04

(b) Find a real root of the equation; $f(x) = x^3 - x - 1 = 0$ by bisection method. 04

(c) Justify that the convergence time of Newton-Raphson is smaller than False-position. 04

Q.3. (a) Define Lagrange's interpolation formula. Find the equation of Laguange's polynomial of degree two passing through three points: (x_0,y_0), (x_1,y_1), (x_2,y_2). 04

(b) Fid the value of $e^{1.21}$ and $e^{1.27}$ using Gauss forward formula from the following table. 04

x	1.00	1.05	1.10	1.15	1.20	1.25	1.30
e^x	2.7183	2.8577	3.0042	3.1582	3.3201	3.4903	3.6693

(c) If $y_1 = 4$, $y_3 = 12$, $y_4 = 19$, $y_x = 7$ then find x by Lagrange's interpolation formula. 04

Q.4. (a) State Gauss's backward formula and use it to find the value of $\sqrt{12525}$ given that $\sqrt{12500} = 111.8034$, $\sqrt{12510} = 111.8481$, $\sqrt{12520} = 111.8928$, $\sqrt{12530} = 111.9375$ and $\sqrt{12540} = 111.9822$. 06

(b) Demonstrate the purpose of using least square curve fitting. Using the method of least squares, fit a curve of the form $y = a/x + bx$ to the following data (x:y):(1,5.43), (2,6.28), (4,10.32), (6,14.86), (8,19.51). 06

SECTION B

Q.5. (a) A rod is rotating in a plane about one of its ends. The angle θ (in radians) at different times t (seconds) are given below. 06

t	0	0.2	0.4	0.6	0.8	1.0
θ	0.0	0.15	0.50	1.15	2.0	3.20

Find its angular velocity and angular acceleration when t = 0.6 seconds.

(b) Using Simpson's 1/3 rule with h = 1, evaluate the integral $I= \int_3^7 x^2 \log x dx$. 06

Q.6. (a) Define numerical differentiation. Consider the following table: 08

x	1.0	1.2	1.4	1.6	1.8	2.0	~~202~~ 2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

(i) Find dy/dx and d^2y/dx^2 at x = 1.60 and (ii) Estimate the total error in dy/dx and d^2y/dx^2 at x = 1.60 considering that the tabulated values are correct to 4 decimal places.

(b) A solid of revolution is formed by the X-axis, the lines x = 0 and x = 1 and a curve through the following tabulated points. Estimate the volume of the solid. 04

x	0.00	0.25	0.25	0.75	1.00
y	1.0000	0.9896	0.9589	0.9089	0.8415

Q.7. (a) Determine the following system is consistent or not? 04
$2x - z - 2u = -8$, $y + 2z - u = -1$, $x - y - u = -6$, $-x + 3y - 2u = 7$.

(b) Use Gauss-Jordan method to solve the system. $4x_1 + 3x_2 - x_3 = 6$, $3x_1 + 5x_2 + 3x_3 = 4$, $x_1 + x_2 + x_3 = 1$. 08

Q.8. (a) Using Euler's method, solve the following problem; $dy/dx = 3/5\, x^3y$, $y(0) = 1$. 05

(b) Given that $y'' - xy' + 4y = 0$, $y(0) = 3$, $y'(0) = 0$, Compute the value of y(0.2) using Rung-Kutta fourth order formula. 07