

PURBANCHAL UNIVERSITY

2023

B. E. ECA/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 60 /Pass Marks: 24

BEC3005 Electronic Circuits

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt ALL questions

Group A

Very short question:

4x2=8

1. Define Input bias and input offset current
2. What is IGBT?
3. Mention applications of 555 Timer
4. Point out the merits and demerits of Dual slope ADC

Group B

7x4=28

Short question:

5. Calculate the gain of a negative feedback amplifier with internal gain of 75 and a feedback fraction of 1/15. What will be the gain if internal gain is doubled?
6. Explain about R-2R ladder DAC with figure and compare with weighted resistor DAC.
7. Explain about Isolation amplifiers and its applications.
8. Explain with figures about crystal oscillator.
9. What is monostable multivibrator? Explain along with its applications
10. With diagram explain IC voltage regulators.
11. Explain the characteristics of non-ideal OP-AMP.

Group C

3x8=24

Long question.

12. Explain the operation of Colpitt's Oscillator with circuit diagram and frequency of oscillation.

Contd. ...

(2)

13. Explain about Class A Push-pull transformer coupled amplifier with efficiency and figures.
14. Draw the 3-OP-AMP configuration of instrumentation amplifier and hence derive its gain. Also point out some of its applications.

B201

PURBANCHAL UNIVERSITY

2023

B. E. ECA/Electrical/Third Semester/Final

Time: 03:00 hrs.

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BEL3005: Network Analysis

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Group A

Very short question:

$4 \times 2 = 8$

1. State the properties of RC impedance network function.
2. Define PRF with suitable example.
3. State final value theorem.
4. Write down Laplace transform of unit impulse, unit step and sinusoidal function

Group B

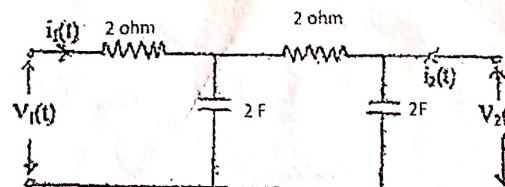
Short question:

$7 \times 4 = 28$

5. In series RC circuit, switch is closed at $t=0$. Obtain the solution for current in the circuit if the excitation voltage is $5e^{-t}$. Assume no charges stored by inductor before $t=0$, $R=5$ ohm and $L=2H$.
6. Derive the expression for voltage across inductance in first order RC circuit when it is excited by dc source.
7. Use pole - zero plot to determine residues and hence obtain time response of the given transfer function:

$$G(s) = \frac{4s}{(s+2)(s^2 + 2s + 2)}$$

8. Determine input impedance for the given network.

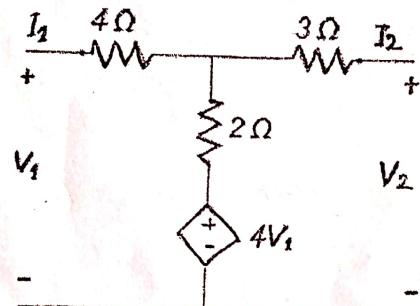


Contd.

9. Synthesize the network function in Cauer I form.

$$Z(s) = \frac{10(s^2+4)(s^2+16)}{s(s^2+9)}$$

10. Derive the condition for symmetry of TPN in terms of h parameters.
 11. Find the Y-parameters of the given TPN.

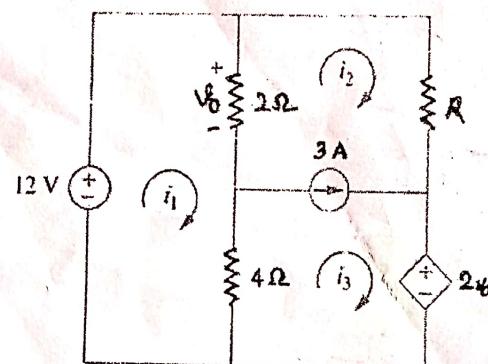


Group C

Long question.

3 -24

12. For $R = 14\Omega$, develop the matrix model using mesh analysis for the network shown in the figure below and hence solve for mesh currents using cramer's rule.

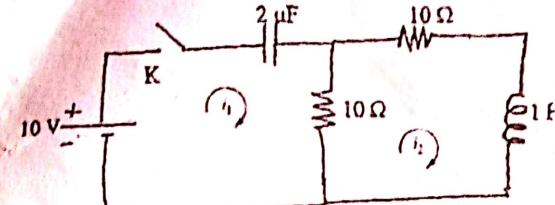


Contd. ...

(3)

13. A series RLC circuit with $R = 3\Omega$, $L = 1 \text{ H}$ and $C = 0.2 \text{ F}$ has dc voltage source 10 volts. Find the resulting current transient if the switch is closed at $t=0$. Use classical method for solving differential equation.

14. In the given circuit, the switch is closed at $t = 0$. Determine i_1 , i_2 , $\frac{di_1}{dt}$, $\frac{di_2}{dt}$, $\frac{d^2i_1}{dt^2}$ and $\frac{d^2i_2}{dt^2}$ at $t=0^+$. Also determine expressions for i_1 and i_2 . Use Laplace transformation method.



PURBANCHAL UNIVERSITY

2023

B. E. Electronics Communication & Automation /Third Semester/Final

Time: 03:00 hrs.

Full Marks: 60 /Pass Marks: 24

BCE3005 Database Management System

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Group-A

Attempt ALL questions

4x2=8

1. What is data redundancy? What is metadata? 1+1
2. Why are entity integrity and referential integrity important in a database? 2
3. When is a table in BCNF? 2
4. What is a recursive join? 2

Group-B

Attempt SEVEN questions

7x4=28

5. What are the three different schema level architectures in a database management system (DBMS)? Please explain each of these schema levels and their roles in managing a database? 4
6. Explain DRC with an example. 4
7. What is a relationship, and what three types of relationships exist? Give an example of each of the three types of relationships. 4
8. Discuss buffer management. 4
9. Given below attribute closure set

$$R = \{A, B, C, G, H, I\}$$

$$F = \{A \rightarrow B, A \rightarrow C, CG \rightarrow H, CG \rightarrow I, B \rightarrow H\}$$

Some members of F^+ such that prove: $A \rightarrow H$, $AG \rightarrow I$, $CG \rightarrow HI$. 4

10. What are the different types of functional dependencies? Explain with examples. 4
11. Discuss the deferred update technique of recovery. What are the advantages and disadvantages of this technique? 2+2
12. What is a hash collision? how do you detect and resolve? 1+3

Contd. ...

Group-C

Attempt THREE questions

 $3 \times 8 = 24$

13. Given this simple description of the company's operations, Entities and their attributes are initially defined.

Employee (PROJ_NUM, PROJ_NAME, EMP_NUM, EMP_NAME, JOB_CLASS, CHG_HOUR, PROJ_NUM, EMP_NUM, ASSIGN_HOURS) Please normalize the above table up to the third normal form (3NF). 8

14. What is the difference between discretionary and mandatory access control? Using a simple example, explain the use of binary and Shared/exclusive locks in a DBMS. 3+5

15. What is a deadlock? Discuss several deadlock avoidance strategies. What are the ACID transaction properties, and could you discuss them? 2+4+2

16. Write SQL statements for following: 2+2+2+2

Student (Enrno, name, courseld, emailid, Phone)

Course (courseld, course_nm, duration)

- (i) Find out list of students who have enrolled in "computer" course.
- (ii) List name of all courses with their duration. iii) List name of all students start with 'a'.
- (iv) List email Id and phone of all Computer engineering students.

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B.E./Third Semester/Final

Time: 03:00 hrs.

Full Marks: 60 /Pass Marks: 24

BSH3008: Mathematics-II

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Group A

Attempt ALL questions.

10×2=20

1. Prove that the matrix $A = \begin{bmatrix} 3 & 7-4i & -2+5i \\ 7+4i & -2 & 3+i \\ -2-5i & 3-i & 4 \end{bmatrix}$ is Hermitian.
2. Show that the transformation $y_1 = 2x_1 + x_2 + x_3$, $y_2 = x_1 + x_2 + 2x_3$, $y_3 = x_1 - 2x_3$ is regular.
3. If the eigen values of a matrix A are 1, 3 and -2, find the eigen values of A^2 , A^T , $\text{Adj}A$ and A^{-1} .
4. Find modal matrix of $\begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$.
5. Find the Laplace transform of $\frac{1-\cos 2t}{t}$.
6. Find the inverse Laplace transform of $\frac{1}{s^2(s+1)}$.
7. Evaluate by using Laplace transform the integral $\int_0^\infty e^{-2t} t \cos t dt$.
8. If a force $\vec{F} = 2x^2 \vec{y} + 3xy \vec{j}$ displaces a particle in the xy-plane from (0,0) to (1,4) along the curve $y = 4x^2$. Find the work done.
9. If the Fourier series of the function $f(x) = |x|$ is given by

$$|x| = \frac{\pi}{2} + \frac{4}{\pi} \left[\frac{\cos x}{1^2} + \frac{\cos 3x}{3^2} + \frac{\cos 5x}{5^2} + \dots \right]$$
Then prove that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$.
10. Obtain the half-range Fourier sine series of $f(x) = x^2$ in the interval $0 \leq x \leq 2$.

Contd. ...

Group B

Attempt ALL questions.

10×4=40

11. Prove that:

$$\begin{vmatrix} 1+x & 2 & 3 \\ 1 & 2+x & 3 \\ 1 & 2 & 3+x \end{vmatrix} = x^2(6+x).$$

12. Find the rank of the matrix by reducing in normal form:

$$\begin{bmatrix} 4 & 2 & -3 \\ 1 & 3 & -6 \\ -5 & 0 & -7 \end{bmatrix}$$

OR,

Find the Eigen vectors of the matrix: $\begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$ 13. Find the inverse Laplace transform of the function by using convolution theorem: $\frac{1}{s^2(s^2+a^2)}$.

14. Solve the initial value problem by Laplace transform method:

$$y'' + 3y' + 2y = e^t, y(0) = 1, y'(0) = 0.$$

OR,

Define unit step function $u(t-a)$. Find its Laplace transformation.

Also, find the Laplace transform of the function:

$$f(t) = \begin{cases} t-1, & \text{for } 1 < t < 2 \\ 0 & \text{otherwise,} \end{cases}$$

15. Show that the vector field $\vec{F} = (x^2 - yz)\vec{i} + (y^2 - zx)\vec{j} + (z^2 - xy)\vec{k}$ is irrotational. Also find a scalar potential ϕ such that $\vec{F} = \nabla\phi$.16. Evaluate $\iint_S \vec{F} \cdot \hat{n} \, ds$ where $\vec{F} = 18z\vec{i} - 12\vec{j} + 3y\vec{k}$ and S is the surface of the plane $2x + 3y + 6z = 12$ in the first octant.

OR,

Find the volume of the ellipsoid

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1, \text{ using Dritchlet's integral.}$$

Contd. ...

(3)

17. Apply Green's theorem to evaluate $\int [(y - \sin x)dx + \cos x dy]$
where C is the plane triangle enclosed by the lines
 $y = 0, x = \frac{\pi}{2}, y = \frac{2x}{\pi}$.

18. Using Gauss Divergence theorem evaluate $\iint_S \vec{F} \cdot \hat{n} ds$ where S is
the surface of the sphere $x^2 + y^2 + z^2 = 4$.

19. Find the Fourier series of the function
 $f(x) = \sin x$ for $-\pi \leq x \leq \pi$.

20. Solve the following LPP by Big-M method.

$$\text{Maximize } Z = x_1 + 2x_2 + 3x_3 - x_4$$

Subject to

$$x_1 + 2x_2 + 3x_3 \leq 15$$

$$2x_1 + x_2 + 5x_3 \leq 20$$

$$x_1 + 2x_2 + x_3 + x_4 = 10 \text{ and } x_1, x_2, x_3, x_4 \geq 0$$

$$\& \vec{F} = 2x\vec{i} + 3y\vec{j} + 4z\vec{k}$$

PURBANCHAL UNIVERSITY

2023

B. E. ECA/Electrical/Biomedical/Third Semester/Final
Time: 03:00 hrs. Full Marks: 60 /Pass Marks: 24
BEC3006: Microprocessor

Candidates are required to give their answers in their own words as far as practicable.

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Group A

Very short question:

$4 \times 2 = 8$

1. What is microprocessor?
2. What is the use of time delay?
3. Define address decoder.
4. How many data and address buses are present in 8086?

Group B

Short question:

$7 \times 4 = 28$

5. Explain functions of instruction (i) STA 2050H (ii) ANI 30H (iii) JMP label iv) PUSH B. $1+1+1+1$
6. Explain addressing modes of 8085 microprocessor. 4
7. What are requirements of interfacing ROM with 8085? Explain with diagram. 4
8. Write a program to multiply two hex numbers. 4
9. Describe method of parallel data transfer. 4
10. Explain different types of interrupt. 4
11. What will be content of accumulator and status flags when 8085 subtracts 05H from 06H? 4

Group C

Long question.

$3 \times 8 = 24$

12. Draw block diagram of 8251 Programmable communication interface and explain it. 8

Contd. ...

(2)

OR

Draw internal architecture of 8086 microprocessor and explain. 8

13. Write a program in 8085 to convert HEX to ASCII using subroutine. 8

OR

Write a program in 8086 to add two matrices. 8

14. What is timing diagram? Draw timing diagram of instruction LDA 2040H and explain it. 1+5+2

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EBC3004 Electromagnetics

Candidates are required to give their answers in their own words as far as practicable.

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Attempt ALL questions.

Group A

Very short question:

$$4 \times 2 = 8$$

1. Give scalar and vector product of two vectors. X
2. Define divergence and curl. —
3. What are permittivity and relative permittivity? —
4. State the principle of conservation of charge. —

Group B

Short question:

$$7 \times 4 = 28$$

5. Explain and compare electric field intensity and electric flux density with relations. —
6. State and explain Gauss law in integral form. —
7. State and explain Divergence theorem. —
8. Define gradient and show electric intensity as the negative gradient of a scalar potential. X
9. Define magnetization, classify various magnetic materials. —

OR,

State and explain Ampere's law in point form with expressions. —

10. Define magnetic moment. Explain about magnetic circuits. X

OR,

Derive and Explain about displacement current with its importance.

Contd.

(2)

11. Given the potential field $V=7x^2y-5z$ and a point $P(-6,3,4)$. Find the potential V at point P , the electric field intensity E , the direction of E and the electric flux density D .

Group C

Long question.

$3 \times 8 = 20$

12. What are travelling and standing waves? Derive the expression for standing wave ratio.

OR,

Explain about wave propagation in free space with relations.

13. A lossless transmission line is 100cm long and operates at a frequency of 550 MHz. The line parameters are $L=0.30\mu H/m$ and $C= 110pF/m$. Find the characteristic impedance, the phase constant, the velocity on the line and the input impedance for $Z_L=300\Omega$. Necessary parameters may be assumed.
14. State and explain Coulomb's law. Use it to find the electric field intensity at a point due to infinite line of charge.

