F 7063   (Pages : 3)   Reg. No............................

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B.TECH. DEGREE EXAMINATION, NOVEMBER 2017

Fifth Semester

Branch : Electronics and Communication Engineering

EC 010 505—APPLIED ELECTROMAGNETIC THEORY (EC)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours   Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 marks.

1. State and explain Helmholtz theorem in detail.

2. Define and explain polarization and its significance.

3. Derive the relation among phase, group and free space velocities.

4. Which mode offers wide tuning range in a circular cavity resonator ? Why ? Explain in detail.

5. Derive the input impedance of a $\lambda/4$ transmission line. Assume the line is lossless.

                                                             (5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 marks.

6. Derive the capacitance of a two wire transmission line. Explain the steps.

7. Derive Maxwell's equations in differential form.

8. Prove that TEM modes are not possible in waveguides. Justify your answer.

9. Define and explain the Q factor of a cavity resonator.

10. Compare and contrast Single stub tuner from double stub tuner.

                                                             (5 × 5 = 25 marks)

                                                             Turn over

Part C

Answer **all** *questions.*

Each full question carries 12 marks.

11. (a) State and derive stoke's theorem.

    (b) Derive the inductance of co axial cable. Explain the differences between co axial line and two wire transmission line.

Or

12. (a) Derive the equation of continuity.

    (b) Derive the energy stored in magnetic field.

    (c) State and derive Divergence theorem.

13. (a) State Poynting theorem. Derive the equation of pointing vector. Explain its applications.

    (b) Explain the characteristics of uniform plane waves.

Or

14. (a) Derive the equation for polarization ellipse.

    (b) Define and explain Skin depth. Explain its significance. Derive an expression for skin depth.

15. (a) Explain the characteristics of TE waves. Derive their characteristic equations.

    (b) Discuss the excitation of modes in rectangular waveguides with neat diagrams.

Or

16. (a) Define and explain :

    (i) Cut-off wavelength ;

    (ii) Dominant mode ;

    (iii) Degenerate mode ; and

    (iv) Characteristic impedance.

    (b) Find all the possible modes that will propagate in a rectangular waveguide having cross sectional dimensions of 4×2 cm. The operating frequency is 5 GHz.

17. (a) Explain the characteristics of TE and TM waves in circular wave guide.

    (b) Explain the methods of excitation of modes in circular waveguides with neat diagrams.

Or

18. (a) Explain how a circular cavity resonator can be used as wave meter, with a neat diagram.

    (b) The least resonant frequency for a certain rectangular cavity resonator is found out to be 6 GHz. If the broad and narrow dimensions of the cavity resonator are 4 and 2 cm. respectively, determine its length.

19. (a) Explain the different types of transmission lines, with neat diagrams. Compare their features and potential applications.

    (b) Derive standard transmission line equations.

Or

20. (a) Explain the effect of inductance loading in telephone cables in detail.

    (b) A 75 ohm transmission line, $\lambda/2$ long is terminated in a load resistance of 300 ohms. Determine its input impedance. If the same line is then operated at a frequency half of the original operating frequency, then what would be its effect on the Z_{in} ?

$(5 \times 12 = 60 \text{ marks})$

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B.TECH. DEGREE EXAMINATION, NOVEMBER 2017

Fifth Semester

Branch : Electronics and Communication Engineering

EC 010 503—DIGITAL SYSTEM DESIGN (EC)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours   Maximum : 100 Marks

Part A

Answer all questions.
Each question carries 3 marks.

1. Mention the diverse types of date modelling using Verilog.

2. Comment on decoder can be used as a demultiplexer.

3. Draw a general model for Mealy network using D-Flipflop.

4. List out the ASM chart components.

5. What is a test bench ? What is its relevance in Verilog ?

                                                      (5 × 3 = 15 marks)

Part B

Answer all questions.
Each question carries 5 marks.

6. Write the verilog code for a 3:8 decoder circuit.

7. Describe the internal ROM organisation with neat diagram.

8. Reduce the following state table :

Present state	Next state	
	I/P X = 0	I/P X = 1
A	D, 0	C, 1
B	H, 1	A, 1
C	E, 1	D, 1
D	D, 0	C, 1
E	B, 0	G, 1
F	E, 1	D, 1
G	A, 0	F, 1
H	C, 0	A, 1
I	G, 1	E, 1

                                                      Turn over

9. Explain the relevance of implication table in state machine concepts.

10. Write short notes on FSM.

$(5 \times 5 = 25 \text{ marks})$

Part C

Answer all questions.

Each full question carries 12 marks.

11. Design and implement Binary to Gray code converter Verilog HDL.

Or

12. Design and implement a full adder using Verilog HDL :

    (a) Gate level modelling.

    (b) Structural modelling (using half adder).

13. Simplify the given Boolean function $F(A, B, C, D) = \sum m(0, 1, 2, 8, 10, 11, 14, 15)$ using Quine Mc Clusky algorithm.

Or

14. (a) With a neat block diagram, explain PLA.   (4 marks)

    (b) Implement the functions, $f1(x, y, z) = \sum m(0, 1, 3, 7)$ and $f2(x, y, z) = \sum m(0, 1, 6)$

       using 3X4X2 PLA (true/compliment method).   (8 marks)

15. Design a clocked synchronous sequential circuit which detects the following sequence 101/10101:

Or

16. Design and implement a serial binary adder using D-flip-flops.

17. Design a clocked synchronous sequential machine using T- Flip flops for the following state diagram. Use state reduction if possible. Also use straight binary state assignment.
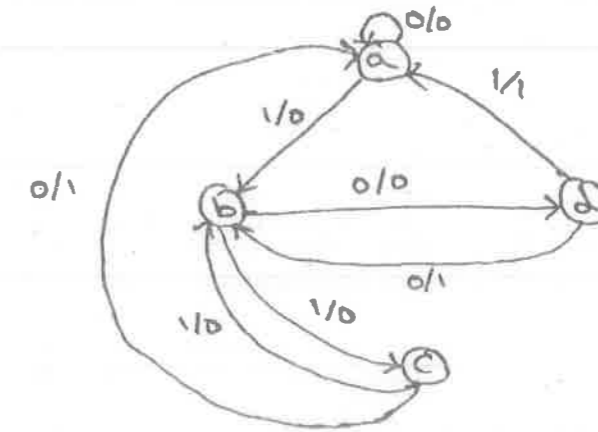
Or

18. (a) Write notes on ASM charts.   (5 marks)

    (b) Draw the ASM chart for a MOD 8 UP/DOWN counter.   (7 marks)

19. Model a 4-bit linear feedback shift register using Verilog HDL.

Or

20. Model a 4 bit binary divider using Verilog HDL.

$[5 \times 12 = 60 \text{ marks}]$

17. Given $G(s) = Ke^{0.2s}/s(s+1)(s+3)$. Draw the Bode plot the find K for the following two cases :

    (a) Gain margin equal to 6 db.

    (b) Phase margin equal to 45°.

Or

18. Explain in detail the procedure for Nichol's chart with M and N circles.

19. Determine the state Controllability and Observability of the system described by :

$$\bar{x} = \begin{bmatrix} -3 & 1 & 1 \\ -1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} x + \begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 2 & 1 \end{bmatrix} u \qquad y = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} x.$$

Or

20. (a) Check the Controllability of the following state space system :

$$\dot{x}_1 = x_2 + u_2$$

$$\dot{x}_2 = x_3$$

$$\dot{x}_3 = -2x_2 - 3x_3 + u_1 + u_2.$$

    (b) Obtain the transfer function model for the following state space system :

$$A = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix}, \quad B = \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & 0 \end{bmatrix}, D[0].$$

$(6 + 6 = 12 \text{ marks})$

$[5 \times 12 = 60 \text{ marks}]$

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B.TECH. DEGREE EXAMINATION, NOVEMBER 2017

Fifth Semester

Branch : Electronics and Communication Engineering

EC 010 502—CONTROL SYSTEMS [EC]

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours   Maximum : 100 Marks

Part A

*Answer **all** questions.*
Each question carries 3 marks.

1. Write Mason's gain formula of Signal flow graph. Also, list the basic elements used for modelling a mechanical rotational system.

2. Sketch the response of the second order under damped system.

3. List the rules to obtain the breakaway point in root locus.

4. State and explain Nyquist stability criterion.

5. Discuss the properties of State transition matrix.
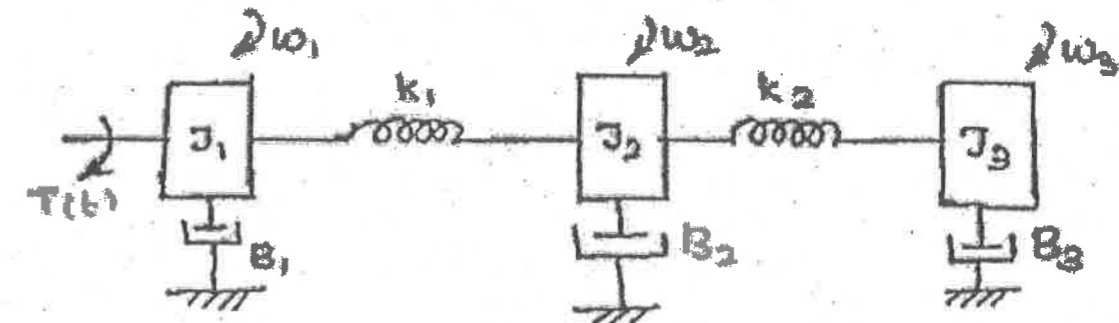
$(5 \times 3 = 15 \text{ marks})$

Part B

*Answer **all** questions.*
Each question carries 5 marks.

6. Draw the torque-voltage electrical analogous circuit for the mechanical system shown below :

Turn over

7. Determine the range of K for stability of unity feedback system whose open loop transfer function is :

$$G(s) = \frac{k}{s(s+1)(s+2)}.$$ Using RH criterion.

8. List all the rules to construct a root locus and explain.

9. Construct the Nyquist plot for a system, whose open loop transfer function is given by $G(s)H(s) = K(1+s)^2 / s^3$. Find the range of K for stability.

10. A system is characterized by the Transfer function $\dfrac{Y(S)}{U(S)} = \dfrac{3}{\left(s^3 + 5s^2 + 11s + 6\right)}$. Identify the first state as output. Determine whether or not the system is completely controllable and observable.

(5 × 5 = 25 marks)

Part C

*Answer **all** questions.*
Each full question carries 12 marks.

11. Using SFG, find the overall Transfer function for the system shown in the figure.

Or

12. Reduce the Block diagram to its Canonical form and obtain $C(s)/R(s)$. Give the Comparison between block diagram and Signal flow graph methods.

13. The unity feedback system is characterized by an open loop transfer function $G(s) = K(2s+1)/s(5s+1)(1+s)^2$ with $r(t) = (1+6t)$. Find the minimum value of K if the steady error is to be less than 0.1.

Or

14. (a) A unit ramp input is applied to a unity feedback system whose transfer function is $C(s) = 100/\left(s^2 + 5s + 100\right)$. Find the time response and steady state error.

(b) Derive an Expression to find steady state error of closed loop system.

(6 + 6 = 12 marks)

15. A Unity feedback control system has $G(s) = 10/s(s+1)$. Design Lead Compensator for the following specification $e_{ss} = 20$ sec, Phase Margin = 50° and Gain Margin ≥ 10 dB.

Or

16. Sketch the root locus of the system whose open loop transfer function is :

$$G(s) = K/s(s+1)(s+3).$$

Find the value of K so that the damping ratio of the Closed loop system is 0.5.

Turn over