# University of Mumbai
## Examination 2020 under cluster Vidyavardhini's College of Engg & Tech

**Program: Electronics Engineering**
**Curriculum Scheme: Rev2016 (CBCGS)**
**Examination: Second Year Semester IV**

**Course Code: ELX401** **Course Name: Applied Mathematics-IV**
**Time: 1 hour** **Max. Marks: 50**

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Note:
1. All Questions are compulsory and carry equal marks.
2. Assume suitable data wherever necessary.

| | |
|---|---|
| Q1. | Find the extremal of $\int_{x_1}^{x_2} \frac{y'^2}{x} dx$ |
| Option A: | $y = c_1x^3 + c_2$ |
| Option B: | $y = c_1x^2 + c_2$ |
| Option C: | $y = c_1x + c_2$ |
| Option D: | $y = c_1x^3 + c_2x$ |
| | |
| Q2. | The necessary condition for the functional $\int_{x_1}^{x_2} f(x, y, y', y")$ to be extremum is |
| Option A: | $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y}\right)=0$ |
| Option B: | $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right)=0$ |
| Option C: | $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) - \frac{d^2}{dx^2}\left(\frac{\partial f}{\partial y"}\right)=0$ |
| Option D: | $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) + \frac{d^2}{dx^2}\left(\frac{\partial f}{\partial y"}\right)=0$ |
| | |
| Q3. | The curve represents shortest distance between two points is a |
| Option A: | Straight line |
| Option B: | Parabola |
| Option C: | Exponential curve |
| Option D: | NONE |
| | |
| Q4. | For vector u=(2,3,0) and v=(4,2,1) which of the following holds |
| Option A: | $\|u \cdot v\| > \|\|u\| \cdot \|\|v\|\|$ |
| Option B: | $\|u \cdot v\| = \|\|u\| \cdot \|\|v\|\|$ |
| Option C: | $\|u \cdot v\| < \|\|u\| \cdot \|\|v\|\|$ |
| Option D: | $\|u \cdot v\| < \|\|u\| \cdot \|\|u\|\|$ |
| | |
| Q5. | Find the value of k for which u=(k,k,3) and v=(k,-6,3) are orthogonal |
| Option A: | k=-3 |
| Option B: | k=3 |
| Option C: | k=1 |
| Option D: | k=2 |
| | |
| Q6. | If W is subset of 2X 2 matrices of the form $\begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$ and V is the set of all 2X2 matrices then |

| | |
|---|---|
| Option A: | W is a subspace of V |
| Option B: | W is not a subspace of V |
| Option C: | V is a subspace of W |
| Option D: | Both are same |
| | |
| Q7. | $V = R^2$ with addition and scalar multiplication given by $(x_1, y_1) + (x_2, y_2) = (x_1 + x_2, 0)$; $k(x_1, y_1) = (kx_1, ky_1)$ is not a vector space as |
| Option A: | There is no additive identity |
| Option B: | There is no additive inverse |
| Option C: | V is not closed under addition |
| Option D: | V is not closed under multiplication |
| | |
| Q8. | $\lambda = 5$ is the eigenvalue of $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$. The eigenvector corresponding to eigenvalue $\lambda = 5$ is |
| Option A: | $[1 \ -1 \ 0]'$ |
| Option B: | $[1 \ 2 \ 3]'$ |
| Option C: | $[1 \ 1 \ 1]'$ |
| Option D: | $[1 \ 0 \ -1]'$ |
| | |
| Q9. | The set of all eigen vectors corresponding to a matrix is always |
| Option A: | Linearly dependent |
| Option B: | Linearly independent |
| Option C: | Not necessarily dependent |
| Option D: | Not necessarily independent |
| | |
| Q10. | $\begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$ is similar to which of the following matrix? |
| Option A: | $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ |
| Option B: | $\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ |
| Option C: | $\begin{bmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -3 \end{bmatrix}$ |

| | |
|---|---|
| Option D: | $\begin{bmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ |
| | |
| Q11. | IF A $= \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ then eigen values of $3\,A^{-1} + 2A + I$ are |
| Option A: | -2,10 |
| Option B: | -4, 8 |
| Option C: | -5,7 |
| Option D: | -1,3 |
| | |
| Q12. | If the matrix A has eigen value -1 repeated twice then algebraic multiplicity of A is |
| Option A: | -1 |
| Option B: | 0 |
| Option C: | 1 |
| Option D: | 2 |
| | |
| Q13. | If k is a constant, 'E' denotes expectation, 'V' denotes variance then which of the following is true? |
| Option A: | E (k) = 0, V(k) = 0 |
| Option B: | E (k) = k, V(k) = 0 |
| Option C: | E (k) = 0, V(k) = k |
| Option D: | E (k) = k, V(k) = k |
| | |
| Q14. | What is r -th Moment about origin $\mu'_r$ |
| Option A: | $E(x)^r$ |
| Option B: | $E(x)^2$ |
| Option C: | $E(x)^3$ |
| Option D: | $E(x)^0$ |
| | |
| Q15. | A die is thrown two times. What is the Probability that the sum neither 8 nor 9 |
| Option A: | 1/9 |
| Option B: | ¼ |
| Option C: | ¾ |
| Option D: | 5/9 |
| | |
| Q16. | If mean is 4 and variance is 3 in Binomial distribution. Find number of trials in experiment |
| Option A: | 16 |
| Option B: | 12 |
| Option C: | 4 |
| Option D: | 6 |
| | |
| Q17. | A continuous random variable with p.d.f $f(X) = kx^2, 0 \leq x \leq 1$then k is |
| Option A: | 4 |
| Option B: | ¼ |

| | |
|---|---|
| Option C: | 3 |
| Option D: | 1/3 |
| | |
| Q18. | Evaluate rank correlation coefficient for the following data:<br>X : 12 17 22 27 32<br>Y : 113 119 117 115 121 |
| Option A: | 0.2 |
| Option B: | 0.4 |
| Option C: | 0.5 |
| Option D: | 0.6 |
| | |
| Q19. | The lines of regression are $6Y = 5X + 90$ and 15X=8Y+130. The coefficient of correlation r=? |
| Option A: | 6/5 |
| Option B: | 15/8 |
| Option C: | 1.5 |
| Option D: | 2.25 |
| | |
| Q20. | If r denotes coefficient of correlation then which of the following is true. |
| Option A: | $-\infty \leq r \leq \infty$ |
| Option B: | $-1 \leq r \leq 1$ |
| Option C: | $0 \leq r \leq \infty$ |
| Option D: | $r > 1$ |
| | |
| Q21. | Which of the following represents the poles of $f(z) = \frac{z^2+1}{1-z^2}$ |
| Option A: | $1, i$ |
| Option B: | 0 |
| Option C: | $\pm 1$ |
| Option D: | $\pm i$ |
| | |
| Q22. | Which of the following is the value of $\oint \frac{e^z}{z-2} dz$ along C, where C is $\|z\| = 3$? |
| Option A: | 0 |
| Option B: | $2\pi ie^2$ |
| Option C: | $2\pi ie$ |
| Option D: | $2\pi i$ |
| | |
| Q23. | If f(z) is analytic and $f'(z)$ is continuous at all points inside and on a simple closed curve C, then which of the following statement is correct? |
| Option A: | $\oint_C f(z)\, dz = 1$ |
| Option B: | $\oint_C f(z)\, dz = 2\pi i$ |
| Option C: | $\oint_C f(z)\, dz = 0$ |
| Option D: | $\oint_C f(z)\, dz \neq 0$ |
| | |

| | |
|---|---|
| Q24. | Which of the following represents the singularities of $f(z) = \frac{z-3}{(z-1)(z-2)}$ ? |
| Option A: | $z = 3$ |
| Option B: | $z = 1, 2$ |
| Option C: | $z = -1, -2$ |
| Option D: | $z = 0$ |
| | |
| Q25. | If $z = z_0$ is a simple pole of f(z), then which of the following represents Residue of f(z) at $z = z_0$? |
| Option A: | $\lim_{z \to z_0} f(z)$ |
| Option B: | $\lim_{z \to z_0} (z - z_0) f(z - z_0)$ |
| Option C: | $\frac{1}{(m-1)!} \lim_{z \to z_0} \frac{d^{m-1}}{dz^{m-1}} (z - z_0) f(z)$ |
| Option D: | $\lim_{z \to z_0} (z - z_0) f(z)$ |

# University of Mumbai

## Examination 2020 under Cluster 06

## (Lead College: Vidyavardhini's College of Engg Tech)

**Examinations Commencing from 23rd December 2020 to 6th January 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: SE Semester IV

Course Code: **ELX406** and Course Name: **Linear Control Systems**

Time: 2 hour Max. Marks: 80

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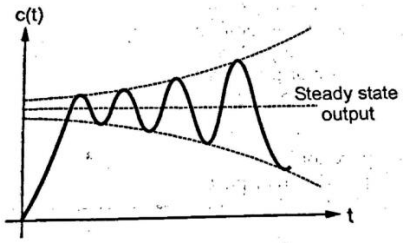
| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** |
|---|---|
| | |
| 1. | An automatic toaster is a _____ loop control system. |
| Option A: | Open |
| Option B: | Closed |
| Option C: | Partially closed |
| Option D: | None of the Options |
| | |
| 2. | Transfer function of a system is defined as the ratio of output to input in |
| Option A: | Z-Transform |
| Option B: | Fourier Transform |
| Option C: | Laplace Transform |
| Option D: | Time domain |
| | |
| 3. | In signal flow graph, a feedback loop consisting of only one node is called as |
| Option A: | Non-touching loop |
| Option B: | Touching loop |
| Option C: | Self-loop |
| Option D: | Forward path |
| | |
| 4. | If for second order system damping factor is less than one, then system response will be |
| Option A: | Undamped |

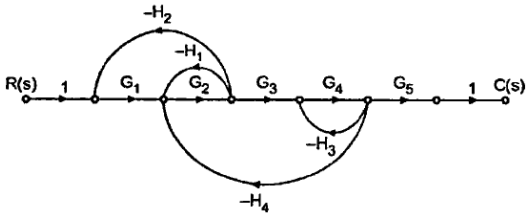
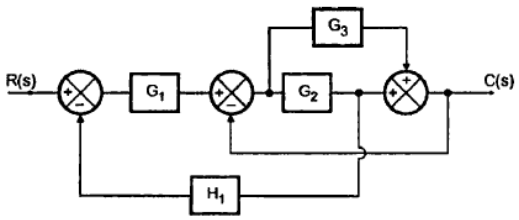
| | |
|---|---|
| Option B: | Overdamped |
| Option C: | Critically damped |
| Option D: | Under damped |
| | |
| 5. | 'Type' of the system means |
| Option A: | Number of zeros at origin of an open loop transfer function |
| Option B: | Number of zeros at origin of a closed loop transfer function |
| Option C: | Number of poles at origin of an open loop transfer function |
| Option D: | Number of poles at origin of a closed loop transfer function |
| | |
| 6. | Step signal is a signal whose value |
| Option A: | Increases linearly with time |
| Option B: | Remains constant with time for time greater than zero |
| Option C: | Varies exponentially with time |
| Option D: | Decreases linearly with time |
| | |
| 7. | The state of the dynamic system is determined using |
| Option A: | State variables |
| Option B: | State space |
| Option C: | State vector |
| Option D: | State scalar |
| | |
| 8. | State space analysis is applicable even if the initial conditions are _____ |
| Option A: | Equal |
| Option B: | Unequal |
| Option C: | Zero |
| Option D: | Non-zero |
| | |
| 9. | The minimum number of state variables required to describe an '$n^{th}$' order differential equation are: |
| Option A: | n-1 |

| | |
|---|---|
| Option B: | n |
| Option C: | n+1 |
| Option D: | n/2 |
| | |
| 10. | State model of a linear system is described by |
| Option A: | State equation |
| Option B: | Output equation |
| Option C: | State equation and output equation |
| Option D: | Transfer Function |
| | |
| 11. | The response of the system is as shown in the fig. The system is_____   |
| Option A: | Stable |
| Option B: | Unstable |
| Option C: | Marginally stable |
| Option D: | Critically stable |
| | |
| 12. | If number of open loop poles are greater than the number of open loop zeros than number of branches in root locus plot will be equal to |
| Option A: | Number of open loop poles |
| Option B: | Number of open loop zeros |
| Option C: | Open loop poles - Open loop zeros |
| Option D: | Open loop poles + Open loop zeros |
| | |
| 13. | In Routh's stability criterion, the number of sign changes in the first column of Routh's array indicates |
| Option A: | Number of roots lying on the imaginary axis |
| Option B: | Number of roots lying in the left half of the s-plane |

| | |
|---|---|
| Option C: | Number of roots lying in the right half of the s-plane |
| Option D: | None of the Options |
| | |
| 14. | Cut off frequency is the frequency at which the magnitude of the closed loop response is_____from its zero frequency value. |
| Option A: | -3dB |
| Option B: | +3dB |
| Option C: | -1dB |
| Option D: | +1dB |
| | |
| 15. | To apply Nyquist stability criterion, polar plot of _____is used |
| Option A: | Characteristic equation |
| Option B: | Closed loop transfer function |
| Option C: | Open loop transfer function |
| Option D: | State model |
| | |
| 16. | A system is said to be unstable when gain crossover frequency is _____ the phase crossover frequency |
| Option A: | Less than |
| Option B: | Greater than |
| Option C: | Equal to |
| Option D: | None of the Options |
| | |
| 17. | Frequency response of a system is defined as |
| Option A: | Steady state response to step input |
| Option B: | Steady state response to sinusoidal input |
| Option C: | Steady state response to ramp input |
| Option D: | Steady state response to impulse function |
| | |
| 18. | MRAC stands for |
| Option A: | Model Reference Advance Control |

| | |
|---|---|
| Option B: | Model Robust Adaptive Control |
| Option C: | Model Reference Adaptive Control |
| Option D: | Model Robust Advance Control |
| | |
| 19. | Which of the following is an input to the controller? |
| Option A: | Servo signal |
| Option B: | Reference input |
| Option C: | Sensed signal |
| Option D: | Error signal |
| | |
| 20. | Lead compensator_____ the bandwidth of the closed loop system. |
| Option A: | Increases |
| Option B: | Decreases |
| Option C: | Does not change |
| Option D: | None of the Options |

| **Q2**<br>**(20 Marks Each)** | |
|---|---|
| A | **Solve any Two** **5 marks each** |
| i. | State and prove the properties of state transition matrix. |
| ii. | Define the steady state error and derive its expression for a simple closed loop system. |
| iii. | Comment on the stability of the system with characteristic equation $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$ using Routh's criterion. |
| B | **Solve any One** **10 marks each** |
| i. | Sketch the root locus for the system with open loop transfer function as:<br>G(s)H(s)=k/s(s+5)(s+10) |
| ii. | Check the controllability and observability for the system: |

| | |
|---|---|
| | $\dot{x} = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 3 \\ 1 & 1 & 1 \end{bmatrix} x + \begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix} u, y = \begin{bmatrix} 1 & 3 & 0 \end{bmatrix} x$ |
| **Q3**<br>**(20 Marks Each)** | |
| A | **Solve any Two** **5 marks each** |
| i. | Using Mason's gain formula, determine the transfer function C(s)/R(s) for the signal flow graph shown in fig.<br>  |
| ii. | A second order system has peak overshoot of 50% and period of oscillations of 0.2 sec in step response. Determine i) Resonant peak and ii) Resonant frequency |
| iii. | Write a short note on PID controllers. |
| B | **Solve any One** **10 marks each** |
| i. | Sketch the polar plot for the system with open loop transfer function as<br>G(s)H(s)=12/s(s+1)(s+2) |
| ii. | Determine the transfer function C(s)/R(s) using block diagram reduction technique for the block diagram shown in the fig.<br>  |

# University of Mumbai
## Examination 2020 under cluster Vidyavardhini's College of Engg & Tech

**Program: BE Electronics Engineering**

**Curriculum Scheme: Revised 2016 (CBCGS)**

**Examination: Second Year Semester IV**

**Course Code: ELX402 Course Name: Electronic Devices and Circuits II**

**Time: 1hour** **Max. Marks: 50**

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Note:

1. All Questions are compulsory and carry equal marks.

2. Assume suitable data wherever necessary.

| | |
|---|---|
| Q1. | Which of the following is not an improvement if negative feedback is introduced in a CE amplifier circuit? |
| Option A: | Higher input impedance |
| Option B: | Better stabilized voltage gain |
| Option C: | Improved frequency response |
| Option D: | Improved voltage gain |
| | |
| Q2. | Determine the voltage gain with feedback for a voltage-series feedback having A = –1000, Rin = 175 kΩ, Ro = 2.5 kΩ, and a feedback of β = –0.25. |
| Option A: | 3.85 |
| Option B: | –3.85 |
| Option C: | –9.09 |
| Option D: | 9.09 |
| | |
| Q3. | In a RC phase-shift oscillator, the gain of the amplifier stage must be greater than _____ to satisfy Barkhausen's criteria. |
| Option A: | 19 |
| Option B: | 29 |
| Option C: | 30 |
| Option D: | 1 |
| | |
| Q4. | The frequency of a Wien bridge oscillator is dependent on the following components? |
| Option A: | R1 and C1 |
| Option B: | C1 and C2 |
| Option C: | R1, R2, C1, and C2 |
| Option D: | R1 and R2 |
| | |
| Q5. | An amplifier incorporates negative feedback using voltage-shunt feedback connection. This feedback will result in _____ |
| Option A: | Increased input impedance and increased output impedance |
| Option B: | Increased input impedance and decreased output impedance |
| Option C: | Decreased input impedance and increased output impedance |

| | |
|---|---|
| Option D: | Decreased input impedance and decreased output impedance |
| | |
| Q6. | Which of the following capacitances does not affect the low frequency response of an RC coupled CE amplifier? |
| Option A: | Input coupling capacitance |
| Option B: | AC bypass capacitance |
| Option C: | output coupling capacitance |
| Option D: | Millers capacitance |
| | |
| Q7. | An amplifier has a input impedance of 1.2 kΩ. The input coupling capacitor is 1 µF. Determine the approximate lower cutoff frequency. |
| Option A: | 133 KHz |
| Option B: | 1.33 kHz |
| Option C: | 13.3 kHz |
| Option D: | 133 Hz |
| | |
| Q8. | The frequency at which the magnitude of the short circuit current gain of RC coupled voltage amplifier goes to 1 (one) is called as _____. |
| Option A: | Critical frequency |
| Option B: | Beta cut-off frequency |
| Option C: | Alpha cut-off frequency |
| Option D: | Unity-gain frequency |
| | |
| Q9. | The overall bandwidth of two identical voltage amplifiers connected in cascade Will _____ . |
| Option A: | Be better if stage gain in low and worse if stage gain is high |
| Option B: | Be worse than that of a single stage |
| Option C: | Remain the same as that of a single stage |
| Option D: | Be better than that of a single stage |
| | |
| Q10. | If three amplifiers with voltage gains of 10db, 25db and 20db are cascaded together, what will be the overall voltage gain? |
| Option A: | 5500db |
| Option B: | 550db |
| Option C: | 55db |
| Option D: | 5000db |
| | |
| Q11. | RC coupling is not used in amplifiers to amplify extremely low frequencies, because of _____ . |
| Option A: | Electrical size of the coupling capacitor |
| Option B: | Low efficiency |
| Option C: | There is considerable power loss |
| Option D: | There is a hum in the output |
| | |
| Q12. | The overall gain of a multistage amplifier is less than the product of the gains of individual stages due to _____ . |
| Option A: | The use of many capacitors |

| | |
|---|---|
| Option B: | Loading effect of the next stage |
| Option C: | The use of many transistors |
| Option D: | Power loss in the coupling device |
| | |
| Q13. | _____ coupling is used to amplify d.c. signal in a multistage amplifier. |
| Option A: | Transformer |
| Option B: | RC |
| Option C: | Impedance |
| Option D: | Direct |
| | |
| Q14. | A differential amplifier has a differential gain of 2000 and a common mode gain of 0.2. The CMRR in dB is equal to _____ . |
| Option A: | 400 |
| Option B: | 80 |
| Option C: | 40 |
| Option D: | 10000 |
| | |
| Q15. | If output is measured between two collectors of transistors, then the Differential amplifier with two input signal is said to be configured as _____ . |
| Option A: | Single Input Balanced Output |
| Option B: | Dual Input Unbalanced Output |
| Option C: | Dual Input Balanced Output |
| Option D: | Dual Input Unbalanced Output |
| | |
| Q16. | To increase the value of CMRR, which circuit is used to replace the emitter resistance $R_E$ in differential amplifier? |
| Option A: | Constant current bias |
| Option B: | Diode in parallel with Re |
| Option C: | Resistor in parallel with Re |
| Option D: | Resistor in series with Re |
| | |
| Q17. | A widlar current source is used |
| Option A: | to get high value of CMRR |
| Option B: | to get low voltage gain |
| Option C: | to get low value of current |
| Option D: | to get high value of Output |
| | |
| Q18. | CE amplifier is used as a large signal class A amplifier because_____ . |
| Option A: | it has very high input impedance |
| Option B: | it has very high output impedance |
| Option C: | it is very much stable |
| Option D: | it has very high voltage gain |
| | |
| Q19. | The DC operating (Q) point in class B amplifier lies in _____ region. |
| Option A: | Cut off |
| Option B: | Active |
| Option C: | Between saturation and active |

| | |
|---|---|
| Option D: | Saturation |
| | |
| Q20. | If DC power for a Class A amplifier is 1000W and AC power is 300W, what is its efficiency? |
| Option A: | 30% |
| Option B: | 50% |
| Option C: | 20% |
| Option D: | 75% |
| | |
| Q21. | Cross over distortion occurs in power amplifiers because of the following: |
| Option A: | due to resistors |
| Option B: | due to Inductors |
| Option C: | due to Capacitors |
| Option D: | switching of transistors after every half cycle |
| | |
| Q22. | The structure of the IGBT is a |
| Option A: | P-N-P-N structure connected by a MOS gate |
| Option B: | N-P-N-P structure connected by a MOS gate |
| Option C: | P-N-P structure connected by a MOS gate |
| Option D: | N-N-P-P structure connected by a MOS gate |
| | |
| Q23. | When a reverse bias voltage exceeding the breakdown voltage is applied to an IMPATT diode, it results in: |
| Option A: | thermal runaway |
| Option B: | avalanche multiplication |
| Option C: | break down of depletion region |
| Option D: | high reverse saturation current |
| | |
| Q24. | The negative resistance region in UJT characteristics lies between_____. |
| Option A: | after valley point |
| Option B: | between peak and valley points |
| Option C: | before peak point |
| Option D: | in all regions |
| | |
| Q25. | The control element of an SCR is _____. |
| Option A: | Anode supply |
| Option B: | Anode |
| Option C: | Gate |
| Option D: | Cathode |

# University of Mumbai
## Examination 2020 under cluster Vidyavardhini's College of Engg & Tech

**Program: BE Electronics Engineering**

**Curriculum Scheme: Revised 2016 (CBCGS)**

**Examination: Second Year Semester IV**

**Course Code: ELX403** **Course Name: Microprocessors and Applications.**

**Time: 1 hour** **Max. Marks: 50**

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Note:

1. All Questions are compulsory and carry equal marks.

2. Assume suitable data wherever necessary.

| | |
|---|---|
| Q1 | 8086 microprocessor has _____ bit Arithmetic Logic Unit. |
| Option A: | 64 |
| Option B: | 32 |
| Option C: | 8 |
| Option D: | 16 |
| | |
| Q2 | 8086 microprocessor has _____ byte pre-fetch queue in bus interface unit. |
| Option A: | 6 |
| Option B: | 4 |
| Option C: | 2 |
| Option D: | 3 |
| | |
| Q3 | 8086 microprocessor can access _____ segments at a time. |
| Option A: | 1 |
| Option B: | 4 |
| Option C: | 3 |
| Option D: | 2 |
| | |
| Q4 | For which addressing mode, the offset address of the operands is directly specified in the instruction? |
| Option A: | Register |
| Option B: | Implied |
| Option C: | Direct |
| Option D: | Immediate |
| | |
| Q5 | _____ string instruction is used to load AL/AX register with a byte / word from data segment. |
| Option A: | LODS |
| Option B: | STOS |
| Option C: | CMPS |
| Option D: | SCAS |
| | |
| | |

| | |
|---|---|
| Q6 | Which instruction forms 2's complement of the specified destination in the instruction? |
| Option A: | NOT |
| Option B: | NEG |
| Option C: | CMP |
| Option D: | DAA |
| | |
| Q7 | The end of a macro can be represented by _____directive. |
| Option A: | END |
| Option B: | ENDS |
| Option C: | ENDP |
| Option D: | ENDM |
| | |
| Q8 | Which interrupt occurs whenever there is division error? |
| Option A: | INT 0 |
| Option B: | INT 2 |
| Option C: | INT 3 |
| Option D: | INT 4 |
| | |
| Q9 | In 8086 microprocessor the total size of Interrupt vector table is _____ |
| Option A: | 1KB |
| Option B: | 2KB |
| Option C: | 128 KB |
| Option D: | 256KB |
| | |
| Q10 | If MN/$\overline{MX}$is low then 8086 operates in ----------mode. |
| Option A: | Minimum |
| Option B: | Maximum |
| Option C: | Multiprocessor |
| Option D: | Single processor |
| | |
| Q11 | In 8086 maximum mode, _____ bus controller is used to generate memory and I/O control signals |
| Option A: | 8286 |
| Option B: | 8288 |
| Option C: | 8284 |
| Option D: | 8087 |
| | |
| Q12 | _____ is multiprocessor mode of 8086. |
| Option A: | Minimum mode |
| Option B: | Maximum mode |
| Option C: | Master mode |
| Option D: | Master-Slave mode |
| | |
| Q13 | $\overline{DEN}$ pin of 8086 is _____ |

| | |
|---|---|
| Option A: | Direct Enable |
| Option B: | Data Entered |
| Option C: | Data Enable |
| Option D: | Data Encoding |
| | |
| Q14 | 8255 is known as _____ |
| Option A: | Programmable Interrupt Controller |
| Option B: | Programmable Peripheral Interface |
| Option C: | Direct Memory Access Controller |
| Option D: | Programmable Interval Timer |
| | |
| Q15 | In the I/O mode, the 8255 ports work as _____ |
| Option A: | reset pins |
| Option B: | set pins |
| Option C: | programmable I/O ports |
| Option D: | only output ports |
| | |
| Q16 | The number of vector interrupts provided by 8259 in a cascade mode is _____ |
| Option A: | 8 |
| Option B: | 16 |
| Option C: | 32 |
| Option D: | 64 |
| | |
| Q17 | In 8259, the register that stores all the interrupt requests in it in order to serve them one by one on a priority basis is _____ |
| Option A: | Interrupt Request Register |
| Option B: | In-Service Register |
| Option C: | Priority resolver |
| Option D: | Interrupt Mask Register |
| | |
| Q18 | The _____ pin is used by DMAC to request the microprocessor to release the system bus. |
| Option A: | HLDA |
| Option B: | HRQ |
| Option C: | ADSTB |
| Option D: | DACK |
| | |
| Q19 | How many modes of data transfer 8237 has? |
| Option A: | 2 |
| Option B: | 4 |
| Option C: | 6 |
| Option D: | 8 |
| | |
| Q20 | Pentium processor has _____ pipelines. |
| Option A: | Two |

| | |
|---|---|
| Option B: | Three |
| Option C: | Four |
| Option D: | Six |
| | |
| Q21 | The instruction cache of Pentium processor is |
| Option A: | read-only cache |
| Option B: | write only cache |
| Option C: | read-write cache |
| Option D: | write back cache |
| | |
| Q22 | In Pentium's super scalar architecture, the number of instructions that are executed per clock cycle is _____ |
| Option A: | 0 |
| Option B: | 1 |
| Option C: | 1.5 |
| Option D: | 2 |
| | |
| Q23 | The unit that is used to implement the multiple branch prediction in Pentium is ____ |
| Option A: | control unit |
| Option B: | bus interface unit |
| Option C: | branch target buffer |
| Option D: | branch instruction register |
| | |
| Q24 | The stage in which the CPU fetches the instructions from the instruction cache in super-scalar organization is_____ |
| Option A: | Prefetch stage |
| Option B: | D1 (first decode) stage |
| Option C: | D2 (second decode) stage |
| Option D: | Final stage |
| | |
| Q25 | When branch prediction is not correct and if the branch is executed in the U-pipeline then cycle penalty incurred is _____ |
| Option A: | 4 cycle penalty is incurred |
| Option B: | 3 cycle penalty is incurred |
| Option C: | 1 cycle penalty is incurred |
| Option D: | 2 cycle penalty is incurred |

# University of Mumbai
# Examination 2020 under cluster Vidyavardhini's College of Engg & Tech

**Program: BE Electronics Engineering**

**Curriculum Scheme: Revised 2016 (CBCGS)**

**Examination: Second Year Semester IV**

**Course Code: ELX404 Course Name: Digital System Design**

**Time: 1 hour** **Max. Marks: 50**

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Note:

1. All Questions are compulsory and carry equal marks.

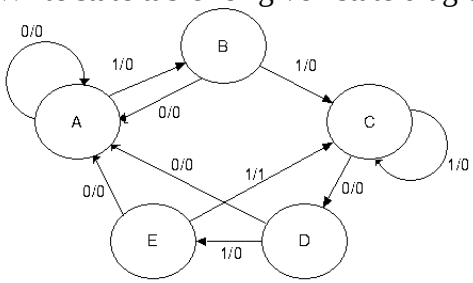
2. Assume suitable data wherever necessary.

| | |
|---|---|
| Q1. | A _____ is type synchronous sequential circuit whose output values are determined only by its present state. |
| Option A: | Mealy Machine |
| Option B: | Moore Machine |
| Option C: | Asynchronous machine |
| Option D: | Finite State Machine |
| | |
| Q2. | Which of the following is not basic component of ASM chart? |
| Option A: | State box |
| Option B: | Transition Table |
| Option C: | Decision box |
| Option D: | Conditional output box |
| | |
| Q3. | MSI Chip IC74169 is the |
| Option A: | Synchronous 4 bit UP/DOWN Binary counter |
| Option B: | Synchronous Decade UP/DOWN Binary counter |
| Option C: | Synchronous 4 bit UP Binary counter |
| Option D: | Asynchronous 4 bit UP/DOWN Binary counter |
| | |
| Q4. | Which of the following is type of signal assignment operator? |
| Option A: | : = |
| Option B: | <= |
| Option C: | == |
| Option D: | != |
| | |
| Q5. | Which of the following line is correct for detecting rising edge of a clock? |
| Option A: | if (clk'EVENT AND clk = '0') |
| Option B: | if (clk'EVENT AND clk = '1') |
| Option C: | if (clk'EVENT OR clk = '0') |
| Option D: | if (clk'EVENT OR clk = '1') |
| | |
| Q6. | CPLD Stands for |
| Option A: | Common Programmable Logic Device |

| | |
|---|---|
| Option B: | Complex Programmable Level Device |
| Option C: | Complex Programmable Logic Device |
| Option D: | Complete Programmable Logic Device |
| | |
| Q7. | _____ is not a type state reduction technique. |
| Option A: | Inspection |
| Option B: | K-map |
| Option C: | Implication Chart |
| Option D: | Partition |
| | |
| Q8. | _____ box indicates the effect of input on control subsystem. |
| Option A: | State Box |
| Option B: | Data Box |
| Option C: | Control Box |
| Option D: | Decision Box |
| | |
| Q9. | IC7493 consist of |
| Option A: | Mod 2 counter and Mod 5 Counter |
| Option B: | Only Mod 8 counter |
| Option C: | Mod 2 and Mod 4 counter |
| Option D: | Mod 2 and Mod 8 Counter |
| | |
| Q10. | In VHDL, PROCESS is a _____ statement. |
| Option A: | Sequential |
| Option B: | Concurrent |
| Option C: | Conditional |
| Option D: | Functional |
| | |
| Q11. | Identify type of library specified in following statement.<br>`use IEEE.std_logic_1164.all;` |
| Option A: | Use |
| Option B: | IEEE |
| Option C: | .all |
| Option D: | std_logic_1164 |
| | |
| Q12. | In _____ both OR array and AND arrays are programmable. |
| Option A: | Programmable logic array |
| Option B: | Programmable array logic |
| Option C: | Programmable level array |
| Option D: | Programmable Adder Logic |
| | |
| Q13. | How many state variables required to represent 3 states? |
| Option A: | 2 |
| Option B: | 1 |
| Option C: | 3 |
| Option D: | 4 |

| | |
|---|---|
| | |
| Q14. | How many flipflops required to design Moore machine sequence detector for sequence "1011" |
| Option A: | 3 |
| Option B: | 2 |
| Option C: | 4 |
| Option D: | 5 |
| | |
| Q15. | ASM Chart has |
| Option A: | 4 exits |
| Option B: | 3 exits |
| Option C: | 2 exits |
| Option D: | Any number of exits |
| | |
| Q16. | Condition: IC74163 , CLR=ENP=ENT=1 , LD=0, ABCD=1010 , What is Output at pin QD, QC,QB,QA |
| Option A: | 1010 |
| Option B: | 0101 |
| Option C: | 1100 |
| Option D: | 0010 |
| | |
| Q17. | The architecture describes _____ digital circuit implemented by _____ modeling.<br>ARCHITECTURE my_arch OF my_design IS<br>BEGIN<br>y1 <= a xor b xor c;<br>y2 <= ( a and b) or (a and c) or (b and c);<br>END my_arch; |
| Option A: | Half adder, behavioral |
| Option B: | Full adder, behavioral |
| Option C: | Half adder, dataflow |
| Option D: | Full adder, dataflow |
| | |
| Q18. | What kind of logic is represented by the given code?<br>ARCHITECTURE my_function of my_logic is<br>BEGIN<br>Y <= x SRL 2;<br>END my_function; |
| Option A: | Divide by 2 |
| Option B: | Divide by 4 |
| Option C: | Multiply by 2 |
| Option D: | Multiply by 4 |
| | |
| Q19. | FPGA consist of CLB's, CLB uses _____ to generate _____. |
| Option A: | LUT, input |
| Option B: | Look up table, output |
| Option C: | input, output |
| Option D: | LUT, LUT |

Q20. Write state table for given state diagram.




Option A:

| Present State | Next State | | Output | |
|---|---|---|---|---|
| | X=0 | X=1 | X=0 | X=1 |
| A | A | B | 0 | 0 |
| B | A | C | 0 | 0 |
| C | D | C | 0 | 0 |
| D | A | E | 0 | 0 |
| E | A | C | 0 | 1 |

Option B:

| Present State | Next State | | Output | |
|---|---|---|---|---|
| | X=0 | X=1 | X=0 | X=1 |
| A | B | B | 1 | 0 |
| B | A | C | 0 | 0 |
| C | C | C | 0 | 0 |
| D | B | E | 0 | 0 |
| E | E | C | 0 | 1 |

Option C:

| Present State | Next State | | Output | |
|---|---|---|---|---|
| | X=0 | X=1 | X=0 | X=1 |
| A | A | A | 0 | 0 |
| B | A | C | 0 | 0 |
| C | D | C | 0 | 1 |
| D | B | E | 0 | 0 |
| E | A | C | 0 | 1 |

Option D:

| Present State | Next State | | Output | |
|---|---|---|---|---|
| | X=0 | X=1 | X=0 | X=1 |
| A | A | B | 0 | 0 |
| B | A | C | 0 | 0 |
| C | D | E | 0 | 0 |
| D | A | E | 0 | 0 |
| E | A | C | 0 | 1 |

Q21. What logic circuit is described by the following code?

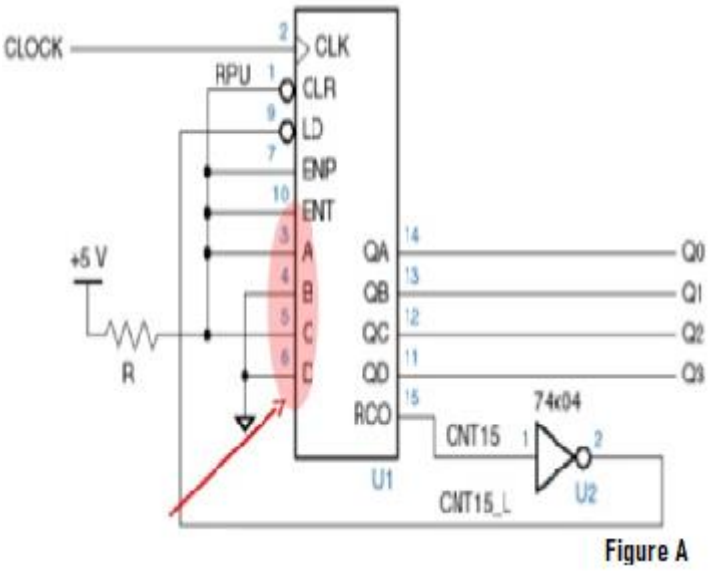
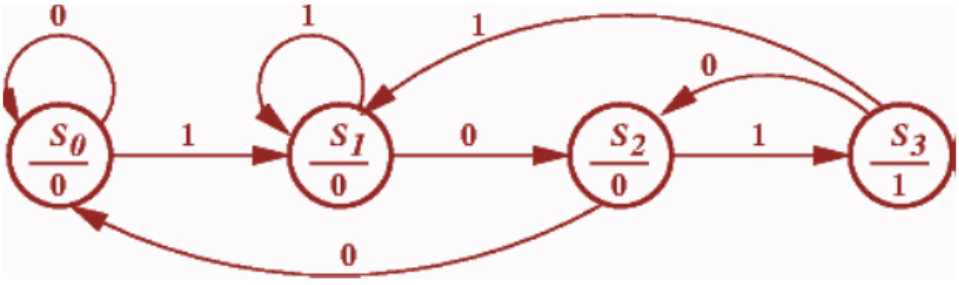
```
ARCHITECUTRE my_circuit OF my_logic IS
BEGIN
WITH ab SELECT
Y <= x0 WHEN "00';
        x1 WHEN "01";
        x2 WHEN "10";
        x3 WHEN "11";
END my_circuit;
```

Option A: Multiplexer

Option B: Demultiplexer

Option C: Decoder

Option D: Encoder

| | |
|---|---|
| Q22. | Identify type of counter design using IC74163.<br>  <br><br>Figure A |
| Option A: | MOD 11 Counter with Count sequence from 5,6,7,8,9,10,11,12,13,14,15,5-15. |
| Option B: | MOD 11 Counter with Count sequence from 0,1,2,3,4,5,6,7,8,9,10,11. |
| Option C: | MOD 11 Counter with Count sequence from 0,1,2,3,4,5,6,7,8,9,10 |
| Option D: | MOD 11 Counter with Count sequence from 5,6,7,8,9,10,11,12,13,14. |
| | |
| Q23. | What is Characteristics equation of D flipflop? |
| Option A: | $Q_n = Q_{n+1}$ |
| Option B: | $Q_{n+1} = Q_n$ |
| Option C: | $Q_{n+1} = D_n$ |
| Option D: | $Q_n = \overline{Q_{n+1}}$ |
| | |
| Q24. | Identify type of machine and the sequence?<br>  <br> |
| Option A: | Mealy machine, 101 |
| Option B: | Moore machine, 101 |
| Option C: | Mealy machine, 1010 |
| Option D: | Moore machine, 1010 |
| | |
| Q25. | IC74194, MR=1 , S0=1 ,S1= 0 ,DSL=X ,DSR=1, Initial output is |

| | |
|---|---|
| | Q0,Q1,Q2,Q3 =0 0 0 0 , What should be the output after 3 rd clock pulse applied |
| Option A: | 1000 |
| Option B: | 1100 |
| Option C: | 1110 |
| Option D: | 1111 |

# University of Mumbai
## Examination 2020 under cluster Vidyavardhini's College of Engg & Tech

**Program: BE Electronics Engineering**

**Curriculum Scheme: Revised 2016 (CBCGS)**

**Examination: Second Year Semester IV**

**Course Code: ELX405** **Course Name: Principles of Communication Engineering**

**Time: 1 hour** **Max. Marks: 50**

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Note:

1. All Questions are compulsory and carry equal marks.

2. Assume suitable data wherever necessary.

| | |
|---|---|
| Q1. | In a communication system, where noise get added? |
| Option A: | During regeneration of signal |
| Option B: | At transmitting antenna |
| Option C: | At the receiving end |
| Option D: | In the channel |
| | |
| Q2. | Frequencies in the UHF range normally propagate by means of |
| Option A: | Surface waves |
| Option B: | Space waves |
| Option C: | Ground waves |
| Option D: | Sky waves |
| | |
| Q3. | In overmodulation, modulation index (m) is- |
| Option A: | 1 |
| Option B: | Less than 1 |
| Option C: | Greater than 1 |
| Option D: | In between 0 to 1 |
| | |
| Q4. | The noise due to random behavior of charge carriers is called as- |
| Option A: | Flicker Noise |
| Option B: | Shot Noise |
| Option C: | Industrial Noise |
| Option D: | Partition Noise |
| | |
| Q5. | The most commonly used filters in SSB generation are- |
| Option A: | Mechanical |
| Option B: | RC |
| Option C: | LC |
| Option D: | Low-pass |
| | |
| Q6. | Vestigial sideband is most commonly used in- |
| Option A: | Radio transmission |

| | |
|---|---|
| Option B: | Radio Propagation |
| Option C: | Television transmission |
| Option D: | Telephony |
| | |
| Q7. | The peak voltage of an AM signal goes from Emax to Emin. The modulation index, m, is: |
| Option A: | (Emax – Emin) / (Emax + Emin) |
| Option B: | (Emax + Emin) / (Emax – Emin) |
| Option C: | Emax / Emin |
| Option D: | Emin / Emax |
| | |
| Q8. | The equation for full-carrier AM is: |
| Option A: | $(E_c \times E_m) \times \sin(\omega_m t) \times \sin(\omega_c t)$ |
| Option B: | $(E_c + E_m) \times \sin(\omega_c t)$ |
| Option C: | $(E_c + E_m) \times \sin(\omega_m t) + \sin(\omega_c t)$ |
| Option D: | $(E_c + E_m \sin(\omega_m t)) \times \sin(\omega_c t)$ |
| | |
| Q9. | The "envelope" of an AM signal is due to: |
| Option A: | The baseband signal |
| Option B: | The modulated signal |
| Option C: | The carrier signal |
| Option D: | The amplitude signal |
| | |
| Q10. | The relation between bandwidth B, modulating frequency fm and frequency deviation Δf for a sinusoidally modulated FM signal is |
| Option A: | B = fm – Δf/ |
| Option B: | B = 2(fm – Δf) |
| Option C: | B = 2(Δf + fm) |
| Option D: | B = Δf + fm |
| | |
| Q11. | The FM broadcast band is from- |
| Option A: | 550 to 1600 kHz |
| Option B: | 88 to 108 MHz |
| Option C: | 88 to 108 kHz |
| Option D: | 1600 kHz to 59.75 MHz |
| | |
| Q12. | Indicate the false statement regarding the Armstrong modulation system- |
| Option A: | Equalization is unnecessary |
| Option B: | The system is basically phase, not frequency modulation, |
| Option C: | Frequency multiplication must be used |
| Option D: | AFC is not needed, as crystal oscillator is used. |
| | |
| Q13. | A pre-emphasis circuit provides extra noise immunity by- |
| Option A: | Boosting the bass frequencies |
| Option B: | Pre amplifying the whole audio band |
| Option C: | Converting the phase modulation to FM |
| Option D: | Amplifying the higher audio frequencies |

| | |
|---|---|
| | |
| Q14. | In a broadcast superheterodyne receiver, the |
| Option A: | Local oscillator frequency is normally double the IF |
| Option B: | Local oscillator operates below the signal frequency |
| Option C: | Mixer input must be tuned to the signal frequency |
| Option D: | RF amplifier normally works at 455 kHz above the carrier frequency |
| | |
| Q15. | One of the main functions of the RF amplifier in a superheterodyne receiver is to- |
| Option A: | Provide improved tracking |
| Option B: | Increase the tuning range of the receiver |
| Option C: | Improve the rejection of the image frequency |
| Option D: | Increase the tuning range of the receiver |
| | |
| Q16. | A superheterodyne receiver with an IF of 450 kHz is tuned to a signal at 1200 kHz. The image frequency is |
| Option A: | 2100 kHz |
| Option B: | 900 kHz |
| Option C: | 800 kHz |
| Option D: | 750 kHz |
| | |
| Q17. | Sensitivity is defined as- |
| Option A: | Ability to reject unwanted signals |
| Option B: | Ability to convert incoming signal into Image Frequency |
| Option C: | Ability to reject noise |
| Option D: | Ability of receiver to amplify weak signals |
| | |
| Q18. | A band-limited signal with a maximum frequency of 5 KHz to be sampled. According to the sampling theorem, the sampling frequency which is not valid is- |
| Option A: | 12 KHz |
| Option B: | 5 KHz |
| Option C: | 15 KHz |
| Option D: | 20 KHz |
| | |
| Q19. | Which of the following pulse modulation systems is analog? |
| Option A: | PWM |
| Option B: | Differential PCM |
| Option C: | PCM |
| Option D: | Delta |
| | |
| Q20. | A distorted signal of frequency fm is recovered from a sampled signal if the sampling frequency fs is- |
| Option A: | fs=2fm |
| Option B: | fs>2fm |
| Option C: | fs<2fm |
| Option D: | fs>=2fm |
| | |

| | |
|---|---|
| Q21. | Calculate the minimum sampling rate to avoid aliasing when a continuous time signal is given by $x(t) = 5 \cos 400\pi t$ |
| Option A: | 100 Hz |
| Option B: | 200 Hz |
| Option C: | 300 Hz |
| Option D: | 400 Hz |
| | |
| Q22. | Each signal in an FDM signal- |
| Option A: | Serves as a subcarrier |
| Option B: | Modulates the main carrier |
| Option C: | Is mixed with all the others before modulation |
| Option D: | Modulates the final carrier |
| | |
| Q23. | Quantizing noise occurs in- |
| Option A: | Pulse-width modulation |
| Option B: | Frequency division multiplex |
| Option C: | Pulse-code modulation |
| Option D: | Time-division multiplex |
| | |
| Q24. | The sharing of a medium and its link by two or devices is called _____. |
| Option A: | Modulation |
| Option B: | Encoding |
| Option C: | Line discipline |
| Option D: | Multiplexing |
| | |
| Q25. | To separate channels in an FDM receiver, it is necessary to use- |
| Option A: | Bandpass filters |
| Option B: | AND gates |
| Option C: | Differentiation |
| Option D: | Integration |

# University of Mumbai
## Examination 2020 under cluster Vidyavardhini's College of Engg & Tech

**Program: BE Electronics Engineering**

**Curriculum Scheme: Revised 2016 (CBCGS)**

**Examination: Second Year Semester IV**

**Course Code: ELX406 Course Name: LINEAR CONTROL SYSTEMS**

**Time: 1hour** **Max. Marks: 50**

==========

Note:

1. All Questions are compulsory and carry equal marks.

2. Assume suitable data wherever necessary.

| | |
|---|---|
| Q1. | For an open loop system, which of the following is incorrect |
| Option A: | It is cheap |
| Option B: | Errors are large |
| Option C: | Systems are accurate |
| Option D: | output is independent of control input |
| | |
| Q2. | A control system in which control action issome how dependent on the output is called |
| Option A: | Open loop system |
| Option B: | Closed loop system |
| Option C: | Semi-closed loop system |
| Option D: | Semi-open loop system |
| | |
| Q3. | In a positive feedback system, overall gain will be |
| Option A: | Decreased |
| Option B: | Increased |
| Option C: | Zero |
| Option D: | unaffected |
| | |
| Q4. | In force current analogy, spring is analogous to |
| Option A: | C |
| Option B: | 1/C |
| Option C: | L |
| Option D: | 1/L |
| | |
| Q5. | The transfer function of the circuit |

| | |
|---|---|
| Option A: | R+RCs |
| Option B: | 1/(1+RCs) |
| Option C: | R+ 1/Cs |
| Option D: | R+Cs |
| | |
| Q6. | What is the overall transfer function of a positive unity feedback system with forward gain as G |
| Option A: | G/(1+GH) |
| Option B: | G/(1+G) |
| Option C: | GH/(1+G) |
| Option D: | G/(1-G) |
| | |
| Q7. | The overall transfer function of the block diagram is |
| Option A: | (G1-G2)/(1+H) |
| Option B: | (G1+G2)/(1+H) |
| Option C: | G1G2/(1+G1G2H) |
| Option D: | G1G2/(1-G1G2H) |
| | |
| Q8. | Which of the following is not a rule of root locus plot |
| Option A: | The root locus starts from open loop pole |
| Option B: | The number of separate branches is equal to number of open loop poles or zeroes |
| Option C: | Root locus is symmetrical about the imaginary axis |
| Option D: | The root locus branches are finally parallel to the asymptotes. |
| | |
| Q9. | In root locus plots, the angle of asymptotes is calculated by_____, where P= no of poles, Z = no of zeros, k=0,1,2….. |
| Option A: | (2k+1)180/(P+Z) |
| Option B: | (2k+1)180/(P-Z) |
| Option C: | (k+1)180/(P-Z) |
| Option D: | (k+1)180/(P+Z) |
| | |
| Q10. | The Bode plot for a numerator term (1+5s), will have a corner frequency of _____ and change of slope at the corner frequency will be _____ |
| Option A: | 5, 20db/d |

| | |
|---|---|
| Option B: | 1/5, 20db/d |
| Option C: | 5, -20db/d |
| Option D: | 1/5, -20db/d |
| | |
| Q11. | In Bode plot, there is a corner frequency of 0.5 and at that frequency ther change f slope is -40db/d, this indicates presence of term_____ in _____ |
| Option A: | $(4+s^2)$, numerator |
| Option B: | (1+4s), denominator |
| Option C: | $(4+s^2)$, numerator |
| Option D: | $(1+4s^2)$, denominator |
| | |
| Q12. | The open loop transfer function of a unity feedback system is $G(s) = \frac{50}{(1+0.1s)(s+10)}$ , Find Kp. |
| Option A: | 2 |
| Option B: | 0 |
| Option C: | 5 |
| Option D: | 0.2 |
| | |
| Q13. | What is the type of system for a unity feedback $G(s) = \frac{10(s+1)}{s^2(s+2)(s+10)}$ |
| Option A: | 2 |
| Option B: | 5 |
| Option C: | 10 |
| Option D: | 4 |
| | |
| Q14. | For a phase lead network, |
| Option A: | Pole is nearer to the origin |
| Option B: | Pole is in the right half of s-plane |
| Option C: | Zero is nearer to the origin |
| Option D: | Zero is in the right half of s-plane |
| | |
| Q15. | Which of the following is not true for a phase lead network |
| Option A: | Band width reduces |
| Option B: | Speed of response increases |
| Option C: | Overshoot reduces |
| Option D: | Steady state error does not show improvement. |
| | |
| Q16. | When a zero is added in the forward path, which of the following is not true |
| Option A: | Band width increases |
| Option B: | Time rise reduces |
| Option C: | Settling time reduces |
| Option D: | System becomes more stable |
| | |
| Q17. | According to the property of state transition method, $e^0$ is equal to |
| Option A: | I |

| | |
|---|---|
| Option B: | A |
| Option C: | $e^{-At}$ |
| Option D: | $-e^{-At}$ |
| | |
| Q18. | The state model for G(s)= $1/(s^2+5s+6)$ can be |
| Option A: | $A = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix}$ ; B=$\begin{bmatrix} 0 \\ 1 \end{bmatrix}$ |
| Option B: | $A = \begin{bmatrix} 0 & 1 \\ 6 & -5 \end{bmatrix}$ ; B=$\begin{bmatrix} 0 \\ 1 \end{bmatrix}$ |
| Option C: | $A = \begin{bmatrix} 0 & 1 \\ -6 & 5 \end{bmatrix}$ ; B=$\begin{bmatrix} 0 \\ 1 \end{bmatrix}$ |
| Option D: | $A = \begin{bmatrix} 0 & 1 \\ 6 & 5 \end{bmatrix}$ ; B=$\begin{bmatrix} 0 \\ 1 \end{bmatrix}$ |
| | |
| Q19. | Which of the following will be a stable system, according to Nyquist criteria |
| Option A: | Gain margin= positive, phase margin= negative |
| Option B: | Gain margin= negative, phase margin= negative |
| Option C: | Gain margin= positive, phase margin= positive |
| Option D: | Gain margin= negative, phase margin= positive |
| | |
| Q20. | The closing of Nyquist plot from $\omega = -j0 \; to \; \omega = j0$ depends on |
| Option A: | Type of system |
| Option B: | Number of poles |
| Option C: | Number of zeros |
| Option D: | Difference between nom of poles and zeros. |
| | |
| Q21. | Transfer function is defined as the laplace transform of output divided by the laplace transform of input with initial conditions as |
| Option A: | 0 |
| Option B: | 1 |
| Option C: | 10 |
| Option D: | infinite |
| | |
| Q22. | For given characteristics equation which having roots on right hand side |
| Option A: | $s^2 + 4s + 1$ |
| Option B: | $s^2 - 4s + 1$ |
| Option C: | $s^3 + 4s^2 + 3s + 1$ |
| Option D: | 6s+1 |
| | |
| Q23. | In root locus plots, the breakaway points are calculated by equating |
| Option A: | dK/ds=1 |
| Option B: | dK/ds=180 |
| Option C: | dK/ds=infinite |

| | |
|---|---|
| Option D: | dK/ds=0 |
| | |
| Q24. | What are the error coefficients for $G(S) = \frac{40(S+2)}{S(S+1)(S+4)}$ |
| Option A: | Kp = ∞ , Kv =20 , Ka = 0 |
| Option B: | Kp = 20 ,Kv = ∞ , Ka = 0 |
| Option C: | Kp = 0 ,Kv =20 , Ka =∞ |
| Option D: | Kp = ∞ , Kv = 0, Ka = 20 |
| | |
| Q25. | which is not the static error coefficient |
| Option A: | $K\,p = \lim_{s\to 0} G(S)H(S)$ |
| Option B: | $K\,v = \lim_{s\to 0} S\,G(S)H(S)$ |
| Option C: | $K\,a = \lim_{s\to 0} S2\,G(S)H(S)$ |
| Option D: | $K\,r = \lim_{s\to 0} S3\,G(S)H(S)$ |

# University of Mumbai

**Examinations Commencing from 23rd December 2020 to 6th January 2021**

Program: Electronics Engineering

Curriculum Scheme: Rev2016 (CBCGS)

Examination: Second Year Semester IV

Course Code: ELX401 and Course Name: Applied Mathematics-IV

Time: 2 hour Max. Marks: 80

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**Note : Q1 carrying 40 marks. Q2 and Q3 are carrying 20 equal marks.**

| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** |
|---|---|
| | |
| Q1. | Brachistocrone Problem is |
| Option A: | Minimal Surface area Problem |
| Option B: | Shortest Time Problem |
| Option C: | Shortest Distance Problem |
| Option D: | Solid of revolutionProblem |
| | |
| Q2. | If $f(x,y,y')$ is independent of $y$ then the Euler Lagrange equation becomes |
| Option A: | $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y}\right)=0$ |
| Option B: | $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right)=0$ |
| Option C: | $\frac{\partial f}{\partial y'}$=C |
| Option D: | $f - y' \frac{\partial f}{\partial y'} = C$ |
| | |
| Q3. | If $u = (u_1, u_2, u_3, \ldots u_n)$ and $v = (v_1, v_2, v_3, \ldots v_n)$ are any two vectors in $R^n$ then which of the following holds |
| Option A: | $\lvert u \cdot v \rvert \leq \lVert u \rVert \cdot \lVert v \rVert$ |
| Option B: | $\lvert u \cdot v \rvert > \lVert u \rVert \cdot \lVert v \rVert$ |
| Option C: | $\lvert u \cdot v \rvert \geq \lVert u \rVert \cdot \lVert v \rVert$ |
| Option D: | $\lvert u \cdot v \rvert = \lVert u \rVert \cdot \lVert v \rVert$ for all u,v |
| | |
| Q4. | Find the value of k for which u=(2,1,3) and v=(1,7,k) are orthogonal |
| Option A: | k=-3 |
| Option B: | k=3 |
| Option C: | k=1 |
| Option D: | k=2 |
| | |
| Q5. | The set of matrices of order 2x2 of the form $\begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$ with usual addition and scalar multiplication is a vector space. Then what will be the additive identity? |
| Option A: | $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ |
| Option B: | $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ |
| Option C: | $\begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$ |

| | |
|---|---|
| Option D: | $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ |
| | |
| Q6. | The characteristic equation of the matrix $\begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -5 & -2 \end{bmatrix}$ is |
| Option A: | $(x-1)(x-2)(x+2)=0$ |
| Option B: | $(x+2)(x+2)(x+1)=0$ |
| Option C: | $(x-2)(x-2)(x-1)=0$ |
| Option D: | $(x-1)(x-1)(x-2)=0$ |
| | |
| Q7. | The eigen values of matrix A are 1,-1,2, then the eigen values of $A^2-3A+I$ are respectively |
| Option A: | -1,5,-1 |
| ption B: | 5,-1,11 |
| Option C: | 1,1,4 |
| Option D: | -2,4,-2 |
| | |
| Q8. | $\lambda=-3$ is the eigenvalue of $A=\begin{bmatrix} -2 & 5 & 4 \\ 5 & 7 & 5 \\ 4 & 5 & -2 \end{bmatrix}$. The eigenvector corresponding to eigenvalue $\lambda=-3$ is |
| Option A: | $[1\ -1\ 0]'$ |
| Option B: | $[1\ 2\ 3]'$ |
| Option C: | $[1\ 1\ 1]'$ |
| Option D: | $[1\ -1\ 1]'$ |
| | |
| Q9. | $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ is similar to which of the following matrix? |
| Option A: | $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ |
| Option B: | $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 5 \end{bmatrix}$ |
| Option C: | $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ |
| Option D: | $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{bmatrix}$ |
| | |
| Q10. | A continuous random variable has probability density function $f(x)=1-\frac{4}{x^2}$, $x\geq 2$, and $f(x)=0$ otherwise. Find mean |
| Option A: | 2 |
| Option B: | ½ |
| Option C: | 4 |
| Option D: | -1/2 |
| | |

| | |
|---|---|
| Q11. | The r -th Moment of the probability distribution X about origin is |
| Option A: | $E(X^r)$ |
| Option B: | $E(X)^3$ |
| Option C: | $E(X^2)$ |
| Option D: | $E(X)$ |
| | |
| Q12. | If V(X)=5 Find V(3X+2)=? |
| Option A: | 15 |
| Option B: | 17 |
| Option C: | 47 |
| Option D: | 45 |
| | |
| Q13. | If mean is 2 and variance is 1 in Binomial distribution. Find number of trials in experiment. |
| Option A: | 16 |
| Option B: | 6 |
| Option C: | 4 |
| Option D: | 3 |
| | |
| Q14. | If coefficient of regression $b_{xy} > 1$ then |
| Option A: | $b_{yx} > 1$ |
| Option B: | $b_{yx} < 1$ |
| Option C: | $b_{yx} = 1$ |
| Option D: | $b_{yx} = 0$ |
| | |
| Q15. | What does it imply if coefficient of correlation is zero |
| Option A: | Perfect positive correlation |
| Option B: | positive correlation |
| Option C: | negative correlation |
| Option D: | No correlation |
| | |
| Q16. | Evaluate $\int_z 2z\,dz$, where C is upper half of the circle \|z\|=1 |
| Option A: | 1 |
| Option B: | -1 |
| Option C: | 0 |
| Option D: | $i\pi$ |
| | |
| Q17. | Evaluate $\int_C \frac{z+6}{z^2-4}\,dz$, where C is the circle $\|z\| = 1$ |
| Option A: | $i\pi$ |
| Option B: | 0 |
| Option C: | $2\,i\pi$ |
| Option D: | $\pi$ |
| | |
| Q18. | Find the residue of $\frac{e^z}{(z-1)^3}$ at its pole |
| Option A: | e/2 |
| Option B: | E |
| Option C: | e/6 |

| | |
|---|---|
| Option D: | e/4 |
| | |
| Q19. | The nature of singularity of $f(z) = z^{-2}e^{z}$ has |
| Option A: | essential singularity at z=0 |
| Option B: | removable singularity at z=0 |
| Option C: | z=0 is a pole of order 2 |
| Option D: | z=0 is a pole of order -2 |
| | |
| Q20. | If f(z) is analytic in and on closed counter C then $\int_C f(z)dz$=? |
| Option A: | 1 |
| Option B: | 0 |
| Option C: | $2\,i\pi$ |
| Option D: | $\pi$ |

| **Q2. (20 Marks)** | **Solve any Four out of Six** **5 marks each** |
|---|---|
| A | Use Rayleigh Ritz Method to solve boundary value problem $\int_0^1 \left(y^2 - y'^2 + 2xy\right) dx$ with y(0) =0 , y(1) = 0 |
| B | Construct an orthonormal basis for the subspace of $R^3$by applying Gram-Schmidt process where S={(1,2,0),(0,3,1)} |
| C | Show that A=$\begin{bmatrix} 7 & 4 & -1 \\ 4 & 7 & -1 \\ -4 & -4 & 4 \end{bmatrix}$is derogatory. |
| D | A discrete random variable has the probability density function:<br>X: -2, -1, 0, 1, 2, 3<br>P(X=x): 0.2, k, 0.1, 2k, 0.1, 2k<br>Find k, mean and variance. |
| E | Calculate Spearman's rank correlation coefficient from the following data<br>X: 18, 20, 34, 52, 12<br>Y: 39, 23, 35, 18, 46 |
| F | Expand $f(z) = \frac{z-1}{z^2-2z-3}$ about z=0 for 1<\|Z\|<3 |

| **Q3.(20 Marks)** | **Solve any Four out of Six** **5 marks each** |
|---|---|
| A | Find the extremal of $\int_0^1 (xy + y^2 - 2y^2y')\,dx$ |
| B | Show that the set of vectors of the form (a,b,c) where b=a+c form a subspace of $R^3$under the usual addition and scalar multiplication. |
| C | Find $A^{-1}$ by using Cayley-Hamilton theorem if $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ |
| D | A manufacturer known from his experience that the resistance of resistors he produces is normal with $\mu = 100$ ohms and standard deviation σ=2 ohms. What percentage of resistors will have resistance between 98 ohms and 102 ohams? |
| E | The equations of regression lines are 3x+2y=26 and 6x+y=31.<br>Find mean $\bar{x}, \bar{y}$ and coefficient of correlation r. |
| F | Evaluate $\int_C \frac{2z-1}{2(2z+1)(z+3)}$dz using residue theorem, where C is \|Z\|=1. |