

POST GRADUATE COMMON ENTRANCE TEST-2017

DATE and TIME	COURSE	SUBJECT
01-07-2017 2.30 p.m. to 4.30 p.m.	ME/M.Tech/M.Arch/ courses offered by VTU/UVCE/UBDTCE	ELECTRICAL SCIENCES (E&E/E&C/TC/BME&ME/IT)
MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
100	150 Minutes	120 Minutes
MENTION YOUR PGCET NO.		QUESTION BOOKLET DETAILS
		VERSION CODE
		SERIAL NUMBER
		A - 1
		113573

DOs:

1. Check whether the PGCET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. Ensure whether the circles corresponding to course and the specific branch have been shaded on the OMR answer sheet.
3. This Question Booklet is issued to you by the invigilator after the 2nd Bell i.e., after 2.25 p.m.
4. The Serial Number of this question booklet should be entered and the respective circles should also be shaded completely on the OMR answer sheet.
5. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely on the OMR answer sheet.
6. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'Ts:

1. THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.
2. The 3rd Bell rings at 2.30 p.m., till then;
 - Do not remove the paper seal / polythene bag of this question booklet.
 - Do not look inside this question booklet.
 - Do not start answering on the OMR answer sheet.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 75 (items) questions and each question will have one statement and four answers. (Four different options / responses.)
2. After the 3rd Bell is rung at 2.30 p.m., remove the paper seal / polythene bag of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
3. During the subsequent 120 minutes:
 - Read each question (item) carefully.
 - Choose one correct answer from out of the four available responses (options / choices) given under each question / item. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **only one response** for each item.
 - **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.**

Correct Method of shading the circle on the OMR answer sheet is as shown below :



4. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
5. After the last Bell is rung at 4.30 pm, stop marking on the OMR answer sheet and affix your left hand thumb impression on the OMR answer sheet as per the instructions.
6. Handover the OMR ANSWER SHEET to the room invigilator as it is.
7. After separating the top sheet (KEA copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
8. Preserve the replica of the OMR answer sheet for a minimum period of ONE year.
9. Only Non-programmable calculators are allowed.

Marks Distribution

PART-A : (Section 1) 30 Questions : $30 \times 1 = 30$ (Section 2) 15 Questions : $15 \times 2 = 30$
PART-B : (Section 1) 20 Questions : $20 \times 1 = 20$ (Section 2) 10 Questions : $10 \times 2 = 20$

EE-A1



(Common to E & E / E & C / TC / BME & ME / IT)

PART - A

(SECTION - I)

Each question carries one mark.

(30 × 1 = 30)

1. If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, then A^n is
(A) $\begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$
(B) $\begin{bmatrix} 3^n & (-4)^n \\ 1 & (-1)^n \end{bmatrix}$
(C) $\begin{bmatrix} 1+3n & 1-4n \\ 1+n & 1-n \end{bmatrix}$
(D) $\begin{bmatrix} 1+2n & -4n \\ 1+n & 1-2n \end{bmatrix}$
2. The extreme value of $(x)^{\frac{1}{x}}$ is
(A) e (B) $\left(\frac{1}{e}\right)^e$
(C) $e^{\frac{1}{e}}$ (D) 1
3. If $x = r \cos \theta$, $y = r \sin \theta$ then
(A) $\frac{\partial x}{\partial r} = 1 / \frac{\partial r}{\partial x}$ (B) $\frac{\partial x}{\partial r} = \frac{\partial r}{\partial x}$
(C) $\frac{\partial x}{\partial r} = 0$ (D) $\frac{\partial x}{\partial \theta} = 0$
4. $\text{div curl } F$ is equal to
(A) zero (B) 1
(C) $\frac{\pi}{2}$ (D) ∞
5. Degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^2 + x\left(\frac{dy}{dx}\right)^5 x^2y = 0$ is
(A) 2 (B) 0
(C) 3 (D) 5
6. The median of the numbers 11, 10, 12, 13, 9 is
(A) 12.5 (B) 12
(C) 10.5 (D) 11
7. A tree is a "sub-graph" of a graph, which does not contain any
(A) Nodes (B) Points
(C) Loops (D) Branches
8. Condition of maximum power transfer when the load and source resistance are purely resistive is
(A) The load impedance is the complex conjugate of the source impedance.
(B) The load resistance is equal to the source resistance.
(C) The load resistance is equal to the magnitude of the source impedance.
(D) None of these
9. Relationship between quality factor and bandwidth in a series resonance circuit is
(A) $Q_s = \frac{f_r}{f_2 - f_1}$ (B) $Q_s = \frac{f_2}{f_2 - f_1}$
(C) $Q_s = \frac{f_1}{f_2 - f_1}$ (D) $Q_s = \frac{f_1 f_2}{f_2 - f_1}$
10. The dual element of conductance is
(A) Inductance (B) Capacitance
(C) Reactance (D) Resistance

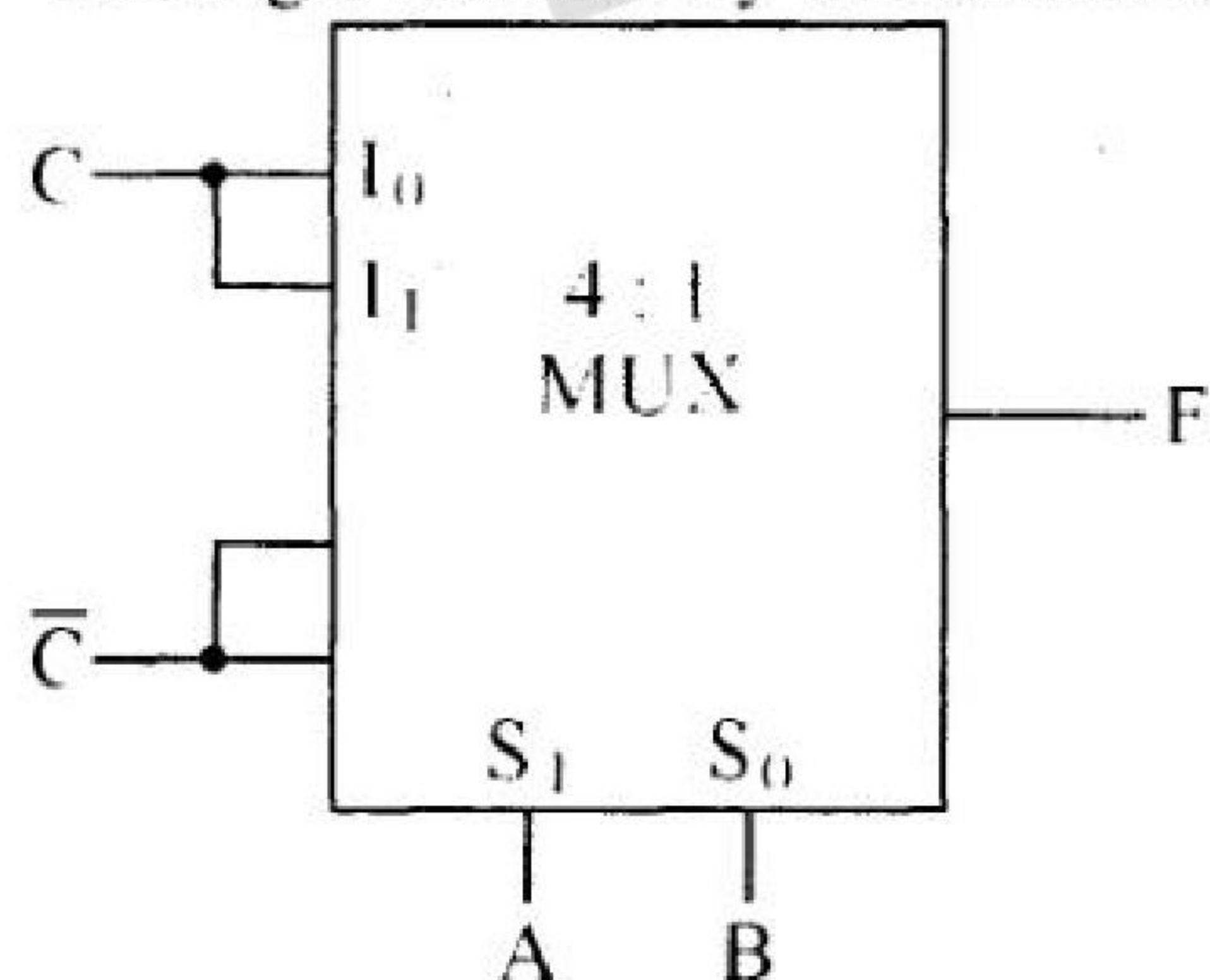
Space For Rough Work

11. 2. Two-port networks are connected in cascade. The combination is to be represented as a single two-port network. The parameters of the network are obtained by multiplying the individual
- (A) z-parameter matrix
 - (B) h-parameter matrix
 - (C) y-parameter matrix
 - (D) ABCD parameter matrix

12. Maxwell's divergence equation for the magnetic field is given by
- (A) $\nabla \times B = 0$
 - (B) $\nabla \cdot B = 0$
 - (C) $\nabla \times B = \rho$
 - (D) $\nabla \cdot B = \rho$

13. The race-around condition in JK latch can be avoided by
- (A) using the edge triggered JK flip-flop
 - (B) using SR latch
 - (C) using SR flip-flop
 - (D) none

14. The logic realized by the circuit shown



- (A) $F = A \odot C$
- (B) $F = B \odot C$
- (C) $F = A \oplus C$
- (D) $F = B \oplus C$

15. A 2-bit binary multiplier can be implemented using
- (A) 2-input ANDs only
 - (B) 2-input XORs and 4-input AND gates only
 - (C) 2-input NORs and one XNOR gate
 - (D) XOR gates and shift registers

16. Twisted Ring Counter is called as
- (A) Shift Register
 - (B) Ring Counter
 - (C) Johnson Counter
 - (D) Ripple Counter

17. _____ type ADC is fastest ADC.
- (A) Flash
 - (B) Servo tracking
 - (C) Dual slope
 - (D) Successive approximation

18. A Boolean function can be expressed
- (A) as sum of max terms or product of min terms
 - (B) as product of max terms or sum of min terms
 - (C) partly as product of max terms and partly as sum of min terms
 - (D) partly as sum of max terms and partly as product of min terms

19. The impulse response of an RL circuit is a
- (A) rising exponential function
 - (B) decaying exponential function
 - (C) step function
 - (D) parabolic function

Space For Rough Work

20. Fourier series of an odd periodic function contains only
 (A) odd harmonics
 (B) even harmonics
 (C) cosine terms
 (D) sine terms
21. The number of roots of $s^3 + 5s^2 + 7s + 3 = 0$
 (A) zero (B) one
 (C) two (D) three
22. None of the poles of a linear control system lie in the right half of s-plane. For a bounded input, the output of this system
 (A) is always bounded
 (B) could be unbounded
 (C) always tends to zero
 (D) always tends to ∞
23. The phase lead compensation is used to
 (A) increase rise time and decrease overshoot
 (B) decrease both rise time and overshoot
 (C) increase both rise time and overshoot
 (D) decrease rise time and increase overshoot
24. A phase-lag compensation will
 (A) improve relative stability
 (B) increase the speed of response
 (C) increase bandwidth
 (D) increase overshoot
25. The ac resistance of the diode is determined by using the equation
 (A) $26 \text{ mV}/I_D$ (B) $2.6 \text{ mV}/I_D$
 (C) $0.26 \text{ mV}/I_D$ (D) $0.026 \text{ mV}/I_D$
26. A good biasing circuit must be capable of performing the following task :
 (A) Operating point must be located in the middle of active region
 (B) Collector current to be stable against variation of temp
 (C) Operating point should not shift even if transistor is replaced by another transistor
 (D) All
27. The efficiency of class B power amplifier is
 (A) 25% to 50% (B) 78.5%
 (C) 50 – 78.5% (D) >78.5%
28. If ' β_1 ' and ' β_2 ' are the current gain of Darlington emitter follower amplifier circuit, then the overall current gain is given by
 (A) $\beta_1 + \beta_2$ (B) $\beta_1 \times \beta_2$
 (C) β_1 / β_2 (D) $\beta_1 - \beta_2$
29. Conditions for a circuit to oscillate are
 (A) Feedback must be positive
 (B) Loop gain must be equal to one
 (C) Phase shift around the ckt to be 0° or 360°
 (D) All
30. Voltage follower circuit can be derived from the _____ circuit.
 (A) Inverting amplifier
 (B) Non-inverting amplifier
 (C) Integrator
 (D) Differentiator

Space For Rough Work

(SECTION – II)

Each question carries two marks.

(15 × 2 = 30)

31. The equations of regression lines are $y = 0.5x + a$ and $x = 0.4y + b$. The correlation coefficient is

(A) $\sqrt{0.2}$ (B) 0.45
(C) $-\sqrt{0.2}$ (D) -0.45

32. The value of $\int_0^1 \frac{1}{1+x} dx$ by Simpson's rule is

(A) 0.96315 (B) 0.63915
(C) 0.69315 (D) 0.69351

33. The product of the eigen values of

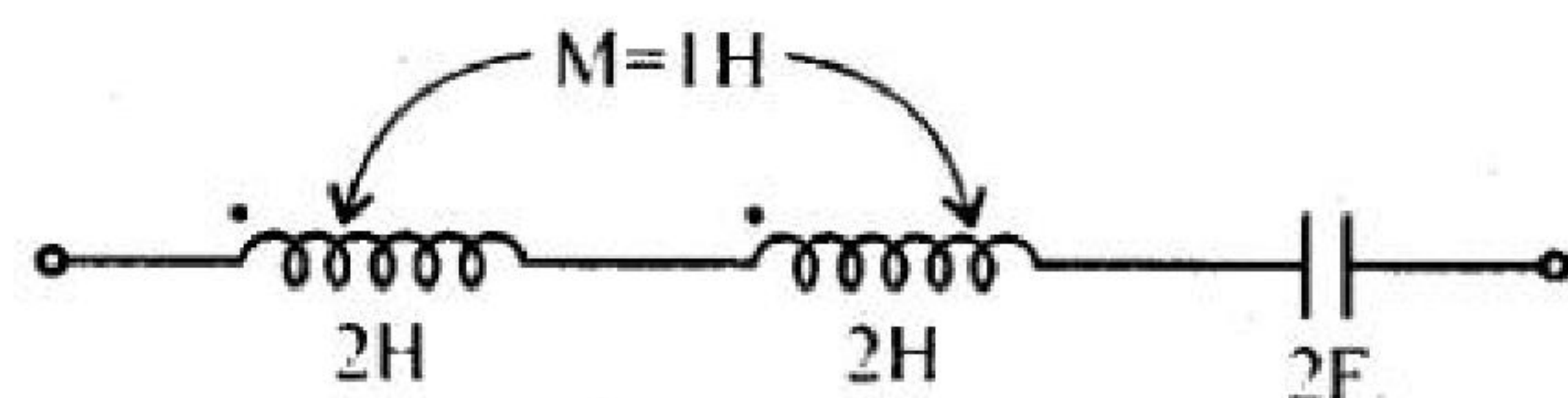
$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & -1 \\ 0 & -1 & 3 \end{bmatrix} \text{ is}$$

(A) -8 (B) 9
(C) 0 (D) 8

34. In a two-terminal network, open-circuit voltage measured at the given terminals by an electronic voltmeter is 100 V. A short-circuit current measured at the same terminals by an ammeter of negligible resistance is 5A. If a load resistor of 80Ω is connected at the same terminals, then current in the load resistor will be

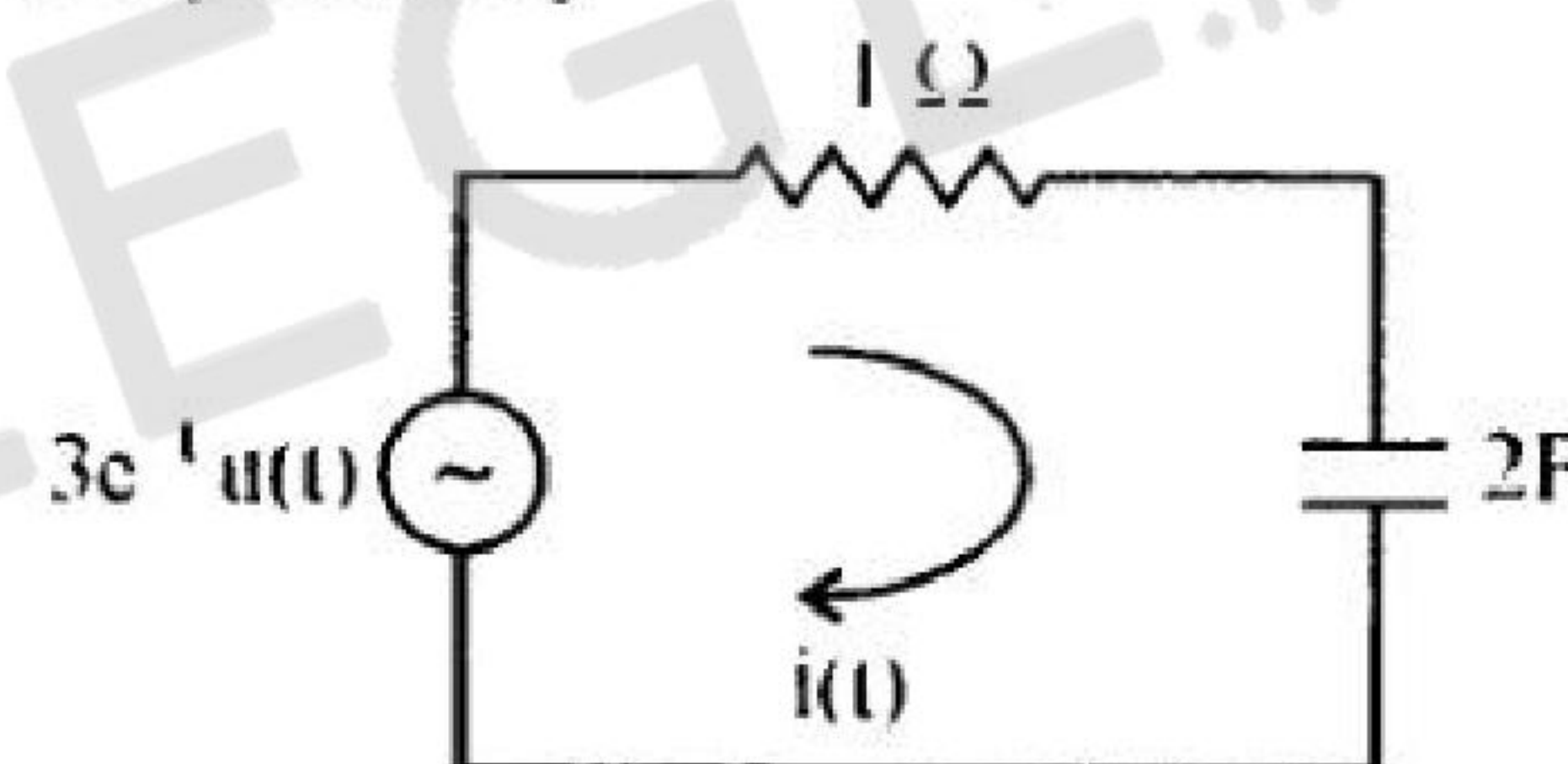
(A) 1A (B) 1.25A
(C) 6A (D) 6.25A

35. The resonant frequency of the given series circuit is



(A) $\frac{1}{2\pi\sqrt{3}}$ Hz (B) $\frac{1}{4\pi\sqrt{3}}$ Hz
(C) $\frac{1}{4\pi\sqrt{2}}$ Hz (D) $\frac{1}{\pi\sqrt{2}}$ Hz

36. In the circuit shown in given figure, the values of $i(0+)$ and $i(\infty)$, will be respectively



(A) zero and 1.5 A
(B) 1.5 A and 3A
(C) 3A and zero
(D) 3A and 1.5A

37. If the unit step response of a system is a unit impulse function, then transfer function of such a system will be

(A) 1 (B) $\frac{1}{s}$
(C) s (D) $\frac{1}{s^2}$

Space For Rough Work

38. For what positive value of K does the polynomial $S^4 + 8S^3 + 24S^2 + 32S + K$ have roots with zero real parts ?

(A) 10
(B) 20
(C) 40
(D) 80

39. The position and acceleration error coefficient for the open-loop transfer function.

$$G(s) = \frac{K}{S^2(S+10)(S+100)} \text{ respectively}$$

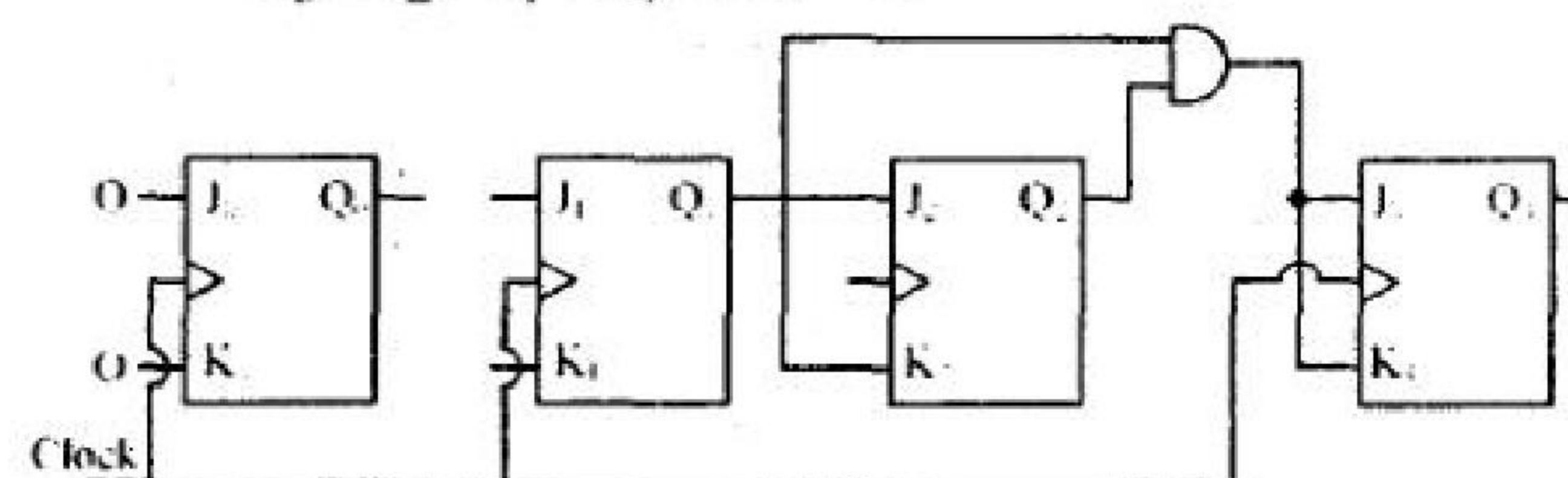
are

(A) zero and infinity
(B) infinity and zero
(C) $\frac{K}{100}$ and zero
(D) infinity and $\frac{K}{1000}$

40. A full-adder can be implemented with half-adders and OR gates. A 4-bit parallel full adder without any initial carry requires

(A) 8 half-adders, 4-OR gates
(B) 8 half-adders, 3-OR gates
(C) 7 half-adders, 4-OR gates
(D) 7 half adders, 3-OR gates

41. For the digital circuit shown, the output $Q_3 Q_2 Q_1 Q_0 = 0001$ initially. After a clock pulse appear, the output $Q_3 Q_2 Q_1 Q_0$ will be



(A) 0001 (B) 0011
(C) 0100 (D) 1100

42. Simplify the given expression using K-map $f(A, B) = \sum m(0, 1, 3)$

(A) $\bar{A} + B$ (B) $A + \bar{B}$
(C) AB (D) $A\bar{B}$

43. The maximum efficiency of a class A power amplifier is found to be _____ if P_{ac} is 5 W and P_{dc} is 10 W.

(A) 5% (B) 50%
(C) 500% (D) 0.5%

44. The slew rate in an instrumentation amplifier will be

(A) as low as possible
(B) as high as possible
(C) very high
(D) None

45. What will be the input resistance of voltage series feedback amplifier having $A_v = 300$, $R_i = 1.5 \text{ k}\Omega$, $R_o = 50 \text{ k}\Omega$ and $\beta = 1/15$.

(A) 3.15 k Ω (B) 31.5 k Ω
(C) 1.35 k Ω (D) 5.13 k Ω

Space For Rough Work

(E & E : ELECTRICAL AND ELECTRONICS ENGINEERING)

PART – B

(SECTION – I)

Each question carries one mark.

(20 × 1 = 20)

46. The current in armature conductor in a DC machine is _____.
(A) Pure DC
(B) Pulsating DC
(C) AC
(D) Pure DC and Pulsating DC
47. DC shunt motor are used in those applications where _____ is required.
(A) high starting torque
(B) practically constant speed
(C) high no load speed
(D) variable speed
48. The primary and secondary of a transformer are _____ coupled.
(A) electrically
(B) magnetically
(C) electro-magnetically
(D) electro-statically
49. A transformer does not possess _____ changing property
(A) impedance (B) voltage
(C) current (D) power
50. The torque characteristic of a 3-phase induction motor is similar to that of _____.
(A) DC series motor
(B) DC shunt motor
(C) DC differentially compounded motor
(D) DC cumulatively compounded motor
51. A 4-pole, 50 Hz induction motor operates at 5% slip. The frequency of emf induced in the rotor will be
(A) 25 Hz
(B) 50 Hz
(C) 2.5 Hz
(D) 10 Hz
52. A turbo alternator uses _____.
(A) salient pole field structure
(B) non-salient pole field structure
(C) rotating AC armature winding
(D) stationary field winding
53. Damper winding in a synchronous motor _____.
(A) reduces windage losses
(B) serves to start the motor
(C) improves the power factor of the motor
(D) increases hunting of the motor
54. The cheapest plant in operation and maintenance is _____.
(A) Steam power plant
(B) Nuclear power plant
(C) Hydroelectric power plant
(D) Diesel power plant

Space For Rough Work

55. The demand factor is generally _____.
- less than 1
 - more than 1
 - equal to 1
 - None of these
56. The self GMD is used to evaluate
- inductance
 - capacitance
 - inductance and capacitance
 - none of these of the overhead transmission lines
57. The main consideration for higher and higher operating voltage of transmission line is to
- increase efficiency of transmission line.
 - reduce power losses.
 - increase power transfer capability.
 - increase efficiency and reduce power losses of transmission line.
58. The bus admittance matrix Y_{BUS} of a power system is not
- symmetric
 - a square matrix
 - a full matrix
 - generally having dominant diagonal elements
59. A reactance relay is
- Voltage restrained directional relay
 - Directional restrained overcurrent relay
 - Voltage restrained overcurrent relay
 - None of these
60. When there is a change in load in a power station having a number of generator units operating in parallel, the system frequency is controlled by
- Adjusting the steam input to the units.
 - Adjusting the field excitation of the generators.
 - Changing the load divisions between the units.
 - Injecting reactive power at station bus bar.
61. The positive and negative sequence impedance of a transmission line are
- Equal
 - Zero
 - Different
 - Infinite
62. A silicon controlled rectifier SCR is a
- unijunction device
 - device with three junctions
 - device with four junctions
 - none of these
63. The thyristor is turned-off when the anode current falls below
- Forward current
 - Latching current
 - Holding current
 - Break over current
64. The ward Leonard system is used for controlling the speed of
- DC motors
 - single-phase AC motors
 - three-phase motors
 - universal motors
65. The speed of the DC machine at rated armature voltage, rated field current and rated armature current is known as
- Base speed
 - Maximum speed
 - Average speed
 - None of these

Space For Rough Work

(SECTION – II)

Each question carries two marks.

(10 × 2 = 20)

66. A d.c. generator has an armature emf of 100 V, when the useful flux per pole is 20 mwb and speed is 800 rpm. The value of generated emf with same flux and a speed of 1000 rpm is
(A) 125 V (B) 200 V
(C) 150 V (D) 250 V
67. A transformer with 800 primary turns and 200 secondary turns is supplied from a 100 V a.c. Supply voltage per turn in secondary winding is
(A) 25 V (B) 2.5 V
(C) 0.125 V (D) 0.25 V
68. An 8-pole alternator runs at 750 rpm and supplies power to a 6-pole induction motor which has a full load slip of 3%. The full load speed of the motor is
(A) 1050 rpm (B) 970 rpm
(C) 960 rpm (D) 1250 rpm
69. In 36 slots, u-pole, 3-phase alternator, the winding pitch is 7 slots. The electrical angle by which the winding is chorded is equal to
(A) 30° (B) 60°
(C) 15° (D) 40°
70. The relation between annual cost C of energy wasted in an overhead transmission line and area of cross-section 'a' of the conductor is
(A) $c \propto a$ (B) $c \propto a^2$
(C) $c \propto \frac{1}{a}$ (D) $c \propto \frac{1}{a^2}$
71. For a round wire of diameter 'd' the fusing current I is given by
(A) $I \propto d$ (B) $I \propto d^{\frac{3}{2}}$
(C) $I \propto d^2$ (D) $I \propto \sqrt{d}$
72. A delta connected load is supplied from a 3-phase supply. The fuse in the B line is removed and current in the other two lines is 20 A. The various line currents (R-phase is reference)
(A) $\vec{I}_r = 20 \angle 60^\circ \text{ A}$, $\vec{I}_y = 20 \angle -60^\circ \text{ A}$,
 $\vec{I}_b = 0 \text{ A}$
(B) $\vec{I}_r = 20 \angle 0^\circ \text{ A}$, $\vec{I}_y = 20 \angle 180^\circ \text{ A}$,
 $\vec{I}_b = 0 \text{ A}$
(C) $\vec{I}_r = 20 \angle 120^\circ \text{ A}$, $\vec{I}_y = 20 \angle -120^\circ \text{ A}$,
 $\vec{I}_b = 0 \text{ A}$
(D) None of these
73. If α is the angle of voltage wave at which an RL circuit is switched in and θ is the impedance angle of the R-L circuit, there will be no transient when the circuit is switched in, if
(A) $\alpha = \theta$
(B) $\alpha = 90 - \theta$
(C) $\alpha = 90 + \theta$
(D) None of these
74. The peak inverse current I_p for a power diode is given by the expression
(A) $I_p = t + \frac{di}{dt}$
(B) $I_p = t * \log i$
(C) $I_p = t * \frac{di}{dt}$
(D) $I_p = t * \int t * i \cdot dt$
75. For a power transistor, if the forward current gain $\alpha = 0.97$, then $\beta = ?$
(A) 0.03 (B) 2.03
(C) 49.24 (D) 32.33

Space For Rough Work

**(E & C AND TC : ELECTRONICS AND COMMUNICATION ENGINEERING AND
TELECOMMUNICATION ENGINEERING)**

**PART - B
(SECTION - I)**

Each question carries one mark.

(20 × 1 = 20)

- | | |
|---|---|
| <p>46. Operating cycle duration for class 'A' amplifier is _____.
(A) 360°
(B) 180°
(C) less than 180°
(D) less than 90°</p> <p>47. Zener diodes are _____ doped.
(A) moderately
(B) heavily
(C) lightly
(D) very lightly</p> <p>48. The directivity for an antenna that radiates over only half a sphere is _____.
(A) 4 (B) 6
(C) 3 (D) 2</p> <p>49. The gain of an antenna is _____.
(A) more than directivity
(B) equal to ∞
(C) less than directivity
(D) equal to directivity</p> | <p>50. A snubber circuit is used to limit _____ within the maximum allowable rating.
(A) di/dt
(B) dv/dt
(C) voltage
(D) current</p> <p>51. A TRIAC is _____.
(A) Two SCRs in series
(B) Two SCRs in parallel
(C) Two SCRs in anti-parallel
(D) Three SCRs in series</p> <p>52. Average power of the signal $X(n) = U(n) =$ _____.
(A) $\frac{1}{2}$
(B) 1
(C) $\frac{1}{4}$
(D) 2</p> |
|---|---|

Space For Rough Work

53. The convolution of $x(n) = \{1, 2, 3\}$ and $\delta(n)$ is
 (A) $\{1, 2, 3\}$
 (B) $f(n)$
 (C) $\{2, 3, 4\}$
 (D) $\{3, 8, 9\}$
54. A combinational circuit has _____.
 (A) large memory
 (B) small memory
 (C) no memory
 (D) medium memory
55. Which of the following is/are the mode of operation of shift register?
 (A) serial i/p serial o/p
 (B) serial i/p parallel o/p
 (C) parallel in serial out
 (D) All of these
56. A network contains linear resistors and ideal voltage sources. If values of all the resistors are doubled, then the voltage across each resistor is
 (A) halved
 (B) increased by four times
 (C) doubled
 (D) not changed
57. Which one of the following theorems occurs when two or more sources act simultaneously in a circuit?
 (A) Superposition theorem
 (B) Thevenin's theorem
 (C) Compensation theorem
 (D) Norton's theorem
58. Maxwell's divergence equation for the magnetic field is given by _____.
 (A) $\nabla \times B = 0$
 (B) $\nabla \cdot B = 0$
 (C) $\nabla \times B = \rho$
 (D) $\nabla \cdot B = \rho$
59. The depth of penetration of a wave in a lossy dielectric increases with increase in
 (A) Conductivity
 (B) Permeability
 (C) Wavelength
 (D) Permittivity

Space For Rough Work

60. Modulation index in AM system is defined as _____ where AM and AC are the amplitudes of message and carrier signals.

- (A) $\frac{AM}{AC}$
- (B) $AM + AC$
- (C) $AM - AC$
- (D) $\frac{AC}{AM}$

61. Ring modulator is known as _____.

- (A) Single balanced modulator
- (B) Triple balanced modulator
- (C) Double balanced modulator
- (D) Unbalanced modulator

62. Most commonly used two scaling factors in VLSI system are _____.

- (A) $\frac{1}{\alpha}$ & $\frac{1}{\beta}$
- (B) α & β
- (C) β
- (D) α

63. Latch up in CMOS devices occurs due to _____.

- (A) $V_R = 0.7 \text{ V}$
- (B) $\beta_1 \text{ \& } \beta_2 \geq 1$
- (C) Both (A) & (B)
- (D) $\beta_1 \text{ \& } \beta_2 \leq 1$

64. The instruction DAA is _____.

- (A) converts Binary to BCD
- (B) converts BCD to Binary
- (C) decrements accumulator
- (D) add contents of accumulator to accumulator

65. A DMA transfer implies

- (A) Direct transfer of data between memory and accumulator.
- (B) Direct transfer of data between memory and I/O devices without use of μp
- (C) Transfer of data exclusively within μp registers.
- (D) A fast transfer of data between μp and I/O devices.

Space For Rough Work

(SECTION - II)

Each question carries two marks.

(10 × 2 = 20)

66. The energy of a discrete-time signal $x(n) = \{2, 4, 1, 1\}$ is equal to

- (A) 23 J
- (B) 24 J
- (C) 22 J
- (D) 30 J

67. An AM system has modulation index $m = 1$ and carries power $P_C = 10$ W. The total power in the system is

- (A) 10 W
- (B) 20 W
- (C) 30 W
- (D) 15 W

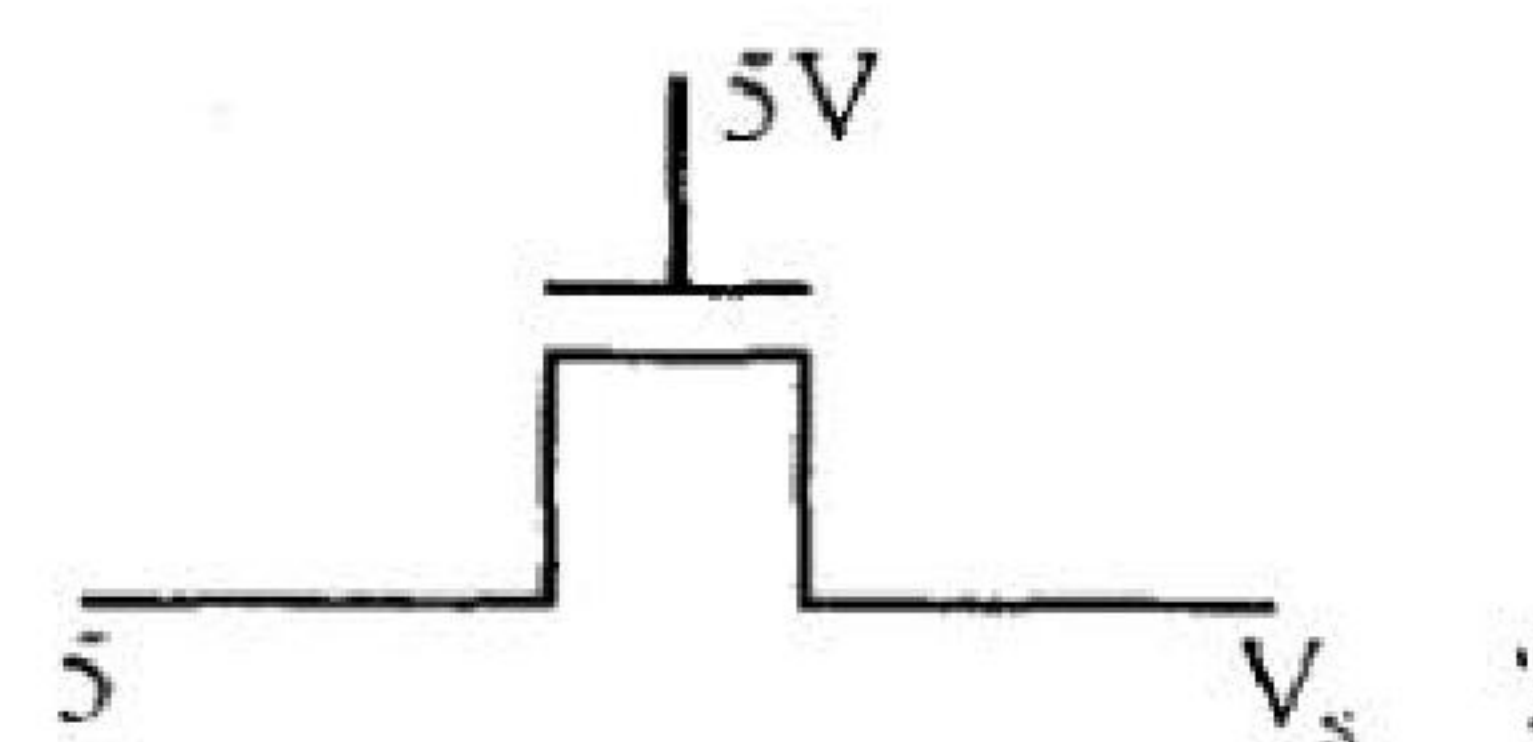
68. An amplifier has mid-band voltage gain of 1000 with 5% feedback applied. The voltage gain of the amplifier with feedback is

- (A) 25
- (B) 23
- (C) 19.6
- (D) 10

69. The divergence function $v = xy\vec{i} + 2yz\vec{j} + 3zx\vec{k}$ at the point $(-1, 1, 2)$ will be

- (A) 2
- (B) 3
- (C) -2
- (D) 5

70. The output voltage V_s for the following pass transistor is



- (A) 2
- (B) 5
- (C) 0
- (D) 3.5

Space For Rough Work

71. The characteristic equation of a level triggered 7-flip flop with T as input and Q as output is

(A) $Q(n+1) = \overline{Q}T + Q\overline{T}$

(B) $Q(n+1) = \overline{T}$

(C) $Q(n+1) = Q$

(D) $Q(n+1) = QT + \overline{Q}\overline{T}$

72. Consider an antenna radiating at 100 MHz frequency. Compute its length assuming it to be a $\frac{\lambda}{2}$ dipole.

The length of the antenna is

(A) 1.5 m

(B) 1 m

(C) 1.25 m

(D) 2 m

73. The inverse laplace transform of damped sine wave $\frac{S}{S^2 + w^2}$ is

(A) $\cos wt$ (B) $\sin wt$

(C) e^{-wt} (D) e^{t^2}

74. A circuit with resistor, inductor and capacitor is resonant at f_0 Hz. If all the component values are now doubled, the new resonant frequency is

(A) $2f_0$ (B) still f_0

(C) $\frac{f_0}{2}$ (D) $\frac{f_0}{4}$

75. In a three phase half wave converters, if the phase voltage is $V_{an} = V_m \sin wt$, the average output voltage for continuous load current is

(A) $\frac{3\sqrt{3} V_m}{2\pi} \cos \alpha$

(B) V_m

(C) $2V_m$

(D) $3\sqrt{3} V_m$

Space For Rough Work

(BME & ME : BIOMEDICAL ENGINEERING & MEDICAL ELECTRONICS)

PART – B

(SECTION – I)

Each question carries one mark.

(20 × 1 = 20)

- | | |
|---|--|
| <p>46. Digitalizing of amplitude values is called</p> <p>(A) Sampling</p> <p>(B) Quantization</p> <p>(C) Resolution</p> <p>(D) Segmentation</p> | <p>49. _____ thresholding depends upon only the gray levels of an image</p> <p>(A) Global</p> <p>(B) Local</p> <p>(C) Adaptive</p> <p>(D) Local and adaptive</p> |
| <p>47. The equation for log transformation is</p> <p>(A) $S = c \log(1 + r)$</p> <p>(B) $S = (L - 1) - r$</p> <p>(C) $S = c \log(1 - r)$</p> <p>(D) $S = (L + 1) - r$</p> | <p>50. MRI stands for</p> <p>(A) Magnetic Reconstruction Imaging</p> <p>(B) Magnetic Reverse Imaging</p> <p>(C) Magnetic Resonance Imaging</p> <p>(D) Multi Reconstruction Imaging</p> |
| <p>48. The secondary colour of light Magenta is obtained by adding primary colours</p> <p>(A) Red + Green</p> <p>(B) Green + Blue</p> <p>(C) Red + Blue</p> <p>(D) Red + White</p> | <p>51. MRI uses</p> <p>(A) X-rays</p> <p>(B) Ultrasonic waves</p> <p>(C) Strong magnetic fields and field gradients</p> <p>(D) Audio waves</p> |

Space For Rough Work

52. Most X-rays have wavelengths in the _____ range.

- (A) 0.01 to 10 millimeter
- (B) 0.01 to 10 micrometer
- (C) 0.01 to 10 meter
- (D) 0.01 to 10 nanometer

53. A low-pass filter in image processing applications is called

- (A) Masking filter
- (B) Notch filter
- (C) Sharpening filter
- (D) Smoothing filter

54. The sum of the filter co-efficients for a low-pass averaging filter is

- (A) -10 (B) -20
- (C) 0 (D) 1

55. The sum of the filter co-efficients for a high pass filter is image* processing application is

- (A) 1 (B) 10
- (C) -1 (D) 0

56. For biomedical applications the mostly used amplifier is

- (A) Single-ended amplifier
- (B) Differential amplifier
- (C) Chopper amplifier
- (D) Inverting operational amplifier

57. Pre-amplifier isolation in ECG circuit is to

- (A) Increase input impedance
- (B) Decrease input impedance
- (C) Increase output impedance
- (D) Decrease output impedance

58. The CT number of water is

- (A) 0 (B) 30
- (C) 40 (D) 60

59. The CT number of air is

- (A) -200
- (B) 200
- (C) 0
- (D) -1000

Space For Rough Work

60. The length of the impulse response of two-sample average is

- (A) 3
- (B) 2
- (C) 4
- (D) 10

61. The volume elements in CT are called

- (A) Pixels
- (B) Slices
- (C) Frames
- (D) Voxels

62. The transducer that converts the input signal into output signal which is a discrete function of time is known as _____ transducer.

- (A) active
- (B) analog
- (C) digital
- (D) pulse

63. If $x(n)$ is real and even, then its DTFT is

- (A) Purely complex
- (B) Purely imaginary
- (C) Purely real
- (D) does not exist

64. The z-transform of sequence $\delta(n)$ is

- (A) 2
- (B) 0
- (C) 1
- (D) z^2

65. Convolution holds good for

- (A) Non-linear systems
- (B) Time-variant systems
- (C) Non-linear and time-variant systems
- (D) Linear and time-invariant systems

Space For Rough Work

(SECTION – II)

Each question carries two marks.

(10 × 2 = 20)

66. In psychovisual redundancy
- (A) certain information has less relative importance than other information in normal visual processing.
 - (B) certain information has high relative importance than other information in normal visual processing.
 - (C) certain information has medium relative importance than other information in normal visual processing.
 - (D) large information has high relative importance than other information in normal visual processing.
67. For eyes pigment the primary colours are
- (A) red, blue and green
 - (B) red and green
 - (C) magenta, cyan and yellow
 - (D) magenta and yellow
68. The fundamental period N of the discrete-time signal $x(n) = \cos(n\pi)$ is
- (A) 3
 - (B) 4
 - (C) 2
 - (D) 6
69. The DFT $X(0)$ for the sequence $x(n) = [1, 1, 1, 1]$ is
- (A) 4
 - (B) 20
 - (C) 0
 - (D) 30
70. Convolution of the signal $x(t)$ with $\delta(t)$ is
- (A) $x(t) * \delta(t) = \delta(t)$
 - (B) $x(t) * \delta(t) = x(t)$
 - (C) $x(t) * \delta(t) = x(t + 1)$
 - (D) $x(t) * \delta(t) = x(t + 2)$
71. Region of convergence ROC of the z-transform of $u(n)$ is
- (A) $|z| < 1$
 - (B) $|z| < 2$
 - (C) $|z| > 6$
 - (D) $|z| > 1$
72. The leads of an ECG are divided into
- (A) 6 limb leads and 6 leg leads
 - (B) 6 chest leads and 6 back leads
 - (C) 6 limb leads and 6 chest leads
 - (D) 6 chest leads & 6 leg leads
73. The _____ takes the output of the preprocessor and performs a test on whether a QRS complex is present or not
- (A) Linear filter
 - (B) Non-linear transformation
 - (C) Decision rule
 - (D) Preprocessor
74. The convolution of $x(n) = [1 \ 1 \ 1]$ with $\delta(n)$ is
- (A) $[3 \ 3 \ 3]$
 - (B) $[2 \ 2 \ 2]$
 - (C) $[0 \ 0 \ 0]$
 - (D) $[1 \ 1 \ 1]$
75. The impulse response $n(x) = \begin{bmatrix} 2 & 3 \\ & 1 \end{bmatrix}$
- (A) casual but not stable
 - (B) non-casual but stable
 - (C) non-casual and unstable
 - (D) stable and casual

Space For Rough Work

(IT : INSTRUMENTATION TECHNOLOGY)

PART – B

(SECTION – I)

Each question carries one mark.

(20 × 1 = 20)

46. Some pots use the combination of the two motions i.e. translational as well as rotational. These pots have their resistive element in the form of a helix and therefore are called
- (A) Wiper
 - (B) Helipots
 - (C) Transducer
 - (D) Meter
47. Which one of the following shows the typical applications of thermistor ?
- (A) Temperature, flow
 - (B) Pressure, force
 - (C) Torque, displacement
 - (D) Thickness, noise
48. Which one of the following instruments are very reliable for static and stable conditions ?
- (A) Electrical instruments
 - (B) Electronic instruments
 - (C) Mechanical instruments
 - (D) Civil instruments
49. Which one of the following shows the typical applications of potentiometer device ?
- (A) Force, torque
 - (B) Temperature, speed
 - (C) Pressure, displacement
 - (D) Thickness, flow
50. Which one of the following is the most widely used inductive transducer to translate the linear motion into electrical signals ?
- (A) Linear variable differential transformer
 - (B) Capacitive transducer
 - (C) Piezo-electric transducer
 - (D) Resistive transducer
51. LVDT is a
- (A) Capacitive transducer
 - (B) Piezo-electric transducer
 - (C) Inductive transducer
 - (D) Thermo electric transducer

Space For Rough Work

52. A system has the transfer function

$$\frac{1-S}{1+S}. \text{ It is called}$$

- (A) low-pass system
- (B) high-pass system
- (C) all-pass system
- (D) band-pass system

53. For a feedback control system type 2, the steady state error for a ramp input is

- (A) infinite
- (B) constant
- (C) zero
- (D) indeterminate

54. Which one of the following is an advantage of a PD controller in terms of damping (δ) and natural frequency (w_n) ?

- (A) δ remains fixed but w_n increases
- (B) δ remains fixed but w_n decreases
- (C) w_n remains fixed but δ increases
- (D) w_n remains fixed but δ decrease

55. A system with transfer function

$$G(S) = \frac{(S^2 + 9)(S + 2)}{(S + 1)(S + 3)(S + 4)}$$

is excited by $\sin(wt)$. The steady-state output of the system is zero at

- (A) $w = 1$ rad/sec
- (B) $w = 2$ rad/sec
- (C) $w = 3$ rad/sec
- (D) $w = 4$ rad/sec

56. Which one of the following convert a physical quantity into an electrical signal ?

- (A) Transducers
- (B) Multiplexer
- (C) Encoders
- (D) Decoders

57. Inverse Chebyshev filter are also called

- (A) Type-I Chebyshev filter
- (B) Type-II Chebyshev filter
- (C) Type-III Chebyshev filter
- (D) Type-IV Chebyshev filter

Space For Rough Work

58. Elliptic filter is sometimes called
 (A) Chebyshev filter
 (B) Butterworth filter
 (C) FIR filter
 (D) Filter has equiripple passband and stopband
59. A system is described by $Y(t) = x(\sin t)$ the system will be
 (A) Non-causal (B) Causal
 (C) Stable (D) Non-stable
60. Energy signal is one which has
 (A) finite energy and finite average power
 (B) finite energy and zero average power
 (C) zero energy and zero average power
 (D) zero energy and finite average power
61. A signal is given $x(t) = A[u(t + a) - u(t - a)]$ for $a > 0$, the energy signal will be
 (A) 0 (B) $2aA^2$
 (C) ∞ (D) $\frac{1}{a}$
62. The measurement refers to which of the following :
 (A) Primary signal
 (B) Measure variable
 (C) Output
 (D) Secondary signal
63. The purpose of instrument is to
 (A) Allow measurements to be made
 (B) Transmit the information
 (C) Change signals
 (D) Output
64. Megger is a measuring instrument, used to measure
 (A) low resistance
 (B) very low resistance
 (C) high resistance
 (D) very high resistance
65. In optical pyrometer temperature is measured by
 (A) Thermocouple effect
 (B) Photocell principle
 (C) Comparison of brightness of the source with that of a standard source
 (D) Liquid discharges

Space For Rough Work

(SECTION – II)

Each question carries two marks.

(10 × 2 = 20)

66. A digital voltmeter has a read-out reading from 0 to 9.999 counts. Determine the resolution of instrument in volt when the full scale reading 9.999 V
(A) 1 mV (B) 4 mV
(C) 5 mV (D) 2 mV
67. A 500 mA voltmeter is specified to be accurate with $\pm 2\%$. Calculate the limiting error when instrument is used to measure 300 mA.
(A) 3.33% (B) 5.56%
(C) 7.77% (D) 8.88%
68. A hall effect transducer is used for the measurement of a magnetic field of 0.5 wb/m^2 . 2mm thick slab is made of Bismuth for which the hall co-efficient is $-1 \times 10^{-6} \text{ V}_m$ and current is 3A
(A) 0.75 mV (B) 0.85 mV
(C) 0.95 mV (D) 0.71 mV
69. Calculate the sensitivity of a 200 μA meter movement which is to be used as a dc voltmeter.
(A) 8 k Ω (B) 9 k Ω
(C) 5 k Ω (D) 10 k Ω
70. Determine the low cutoff frequency f_L of a second order high pass Butterworth filter having the following components :
 $R_2 = R_3 = R = 47 \text{ k}\Omega$
 $C_2 = C_3 = C = 0.0022 \mu\text{F}$
(A) 2.54 kHz (B) 1.54 kHz
(C) 3.54 kHz (D) 4.54 kHz
71. A Lissajous pattern on the oscilloscope is stationary having 8 vertical maximum values and 6 horizontal maximum values. Calculate the frequency of vertical input if the frequency of horizontal input is 1800 Hz.
(A) 4400 Hz (B) 2400 Hz
(C) 8400 Hz (D) 6400 Hz
72. Find the percentage error in measurement if the variable range is 4-20 mA and the measured value is 7 mA with a set point of 10 mA
(A) -12.75% (B) +18.75%
(C) 16.75% (D) -18.75%
73. The horizontal amplifier should be designed for
(A) high frequency signals with a fast rise time.
(B) high amplitude signals with a slow rise time.
(C) high amplitude signals with a fast rise time.
(D) low amplitude signals with a fast rise time.
74. The position telemetering system using synchros is
(A) a pulse telemetering system
(B) a RI telemetering system
(C) a DC telemetering system
(D) an AC telemetering system
75. A photoelectric transducer converts
(A) electric current to voltage.
(B) kinetic energy of electrons into potential energy.
(C) light intensity to voltage.
(D) magnetic field into electric field.

Space For Rough Work

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