

PGCET-2014

EE

DAY and TIME					COURSE		SUBJECT	
DAY-1 10.30 am to 12.30 pm					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 - 2		168178	

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 and also ensure the circle against the appropriate paper you are answering in Part-B is also shaded.
3. This Question Booklet is issued to you by the invigilator after the 2nd Bell i.e., after 10.25 a.m.
4. The Serial Number of this question booklet should be entered 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.
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 10.30 a.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.

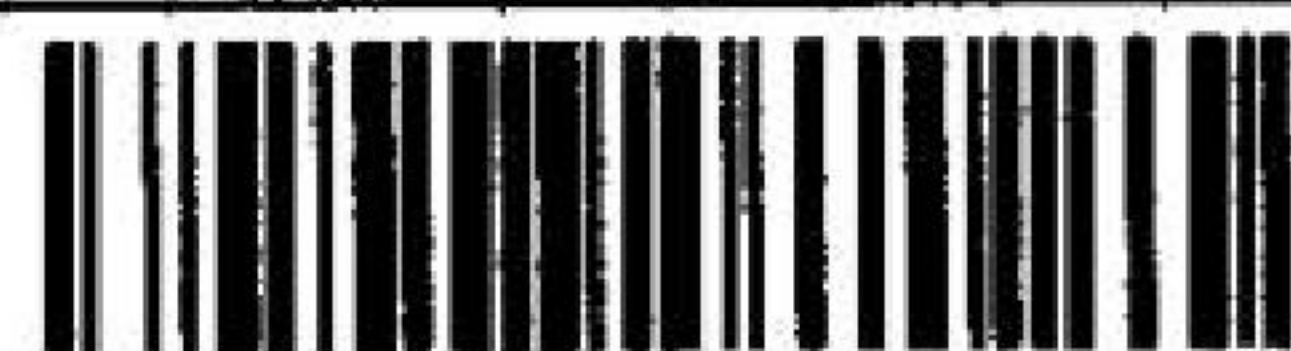
IMPORTANT INSTRUCTIONS TO CANDIDATES

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 10.30 a.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.**
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 12.30 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. Hand over the **OMR ANSWER SHEET** to the room invigilator as it is.
7. After separating the top sheet, 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 I) 30 Questions : $30 \times 1 = 30$ (Section II) 15 Questions : $15 \times 2 = 30$
 Part-B : (Section I) 20 Questions : $20 \times 1 = 20$ (Section II) 10 Questions : $10 \times 2 = 20$

EE-A2



[Turn Over

ELECTRICAL SCIENCE

IMPORTANT INSTRUCTIONS AND BRANCHWISE INDEX FOR THE CANDIDATES

Question Nos. 1 to 45 is compulsory and common to all the branches. Question Nos. 46 to 75 are optional. Sub-branches are there in this booklet. The candidate has to opt any one branch according to his/her Application Form.

Sub-branch	Subject	Page No.	
		From	To
1.	Electrical and Electronics Engineering (E & E)	12	16
2.	Electronics and Communication Engineering (E & C) & Telecommunication Engineering (TC)	17	21
3.	Bio-Medical Engineering (BME) & Medical Electronics (ME)	22	26
4.	Instrumentatin Technology (IT)	27	31

PART – A

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

SECTION – I

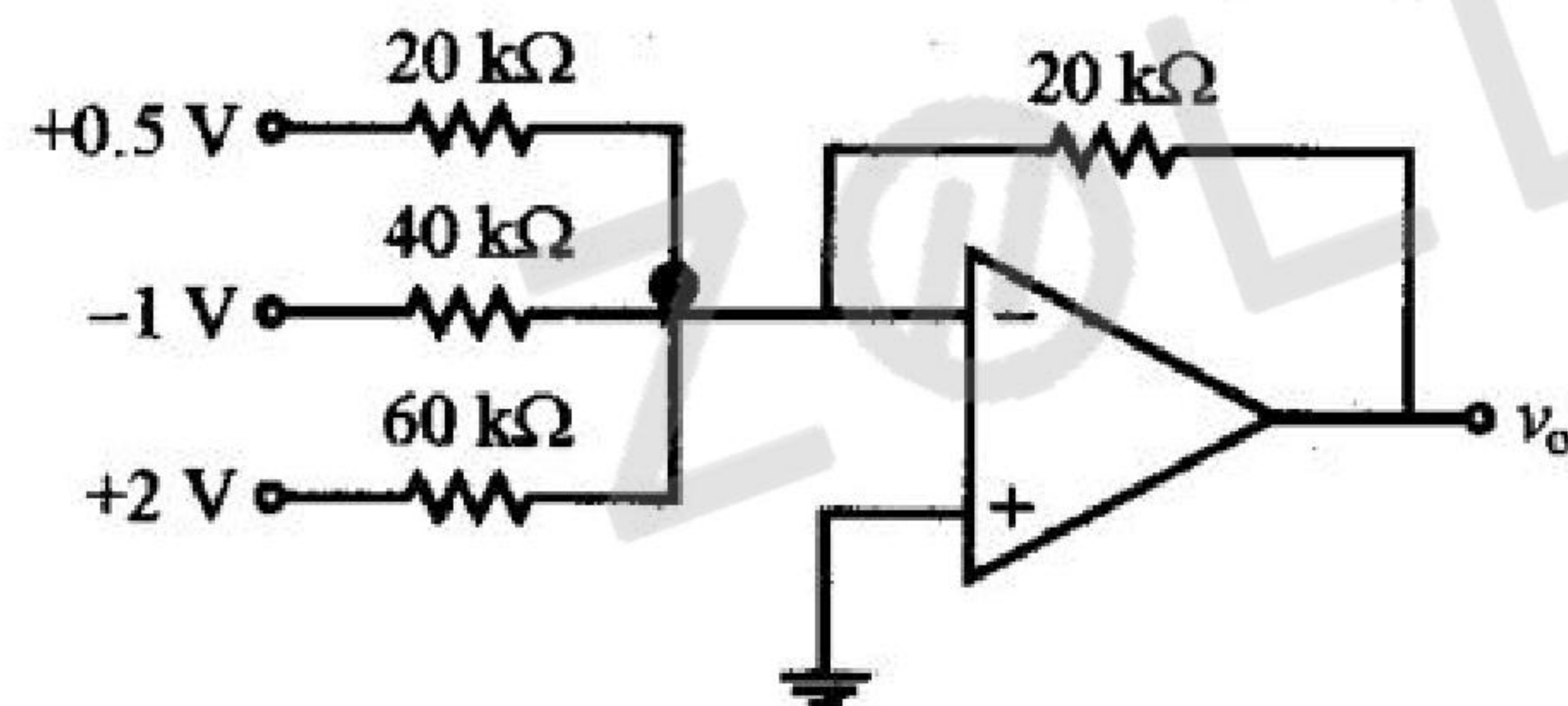
Each question carries one mark.

(30 × 1 = 30)

1. In an amplifier, the output current flows for 200° of input cycle. The class of operation of the amplifier is
(A) A (B) AB
(C) B (D) C
2. In an RC coupled CE amplifier, typical value of coupling capacitor is
(A) 1000 pF (B) 0.1 μF
(C) 10 μF (D) 0.01 μF
3. The common collector amplifier is also called emitter follower because
(A) Emitter current follows the collector current
(B) Emitter voltage follows the collector voltage
(C) Emitter voltage follows the base signal voltage
(D) Emitter current follows the collector voltage
4. In a JFET, dynamic drain resistance, r_d is of the order of
(A) 1 kΩ (B) 10 kΩ
(C) 100 kΩ (D) 100 MΩ
5. Frequency distortion in an amplifier is caused by
(A) Non-linear dynamic characteristics of the active device
(B) Reactive elements in the circuit
(C) Ripple components in the circuit
(D) High temperature of operation

Space For Rough Work

6. In a class B push pull amplifier, ratio of the maximum collector dissipation to maximum AC power output is about
- (A) 0.25 (B) 0.4
(C) 0.5 (D) 0.75
7. In a negative feedback amplifier, voltage sampling:
- (A) Tends to decrease the output resistance
(B) Tends to increase the output resistance
(C) Does not alter the output resistance
(D) Produces the same effect on the output resistance as current sampling
8. Rectification efficiency of a full wave rectifier without filter is nearly equal to
- (A) 51% (B) 61%
(C) 71% (D) 81%
9. In the circuit shown, the output voltage, v_o is



- (A) +2.67 V (B) -2.67 V
(C) -6.67 V (D) +6.67 V
10. The 'Slew rate' of an operational amplifier indicates
- (A) How fast its output current can change.
(B) How fast its output impedance can change.
(C) How fast its output power can change.
(D) How fast its output voltage can change when a step input signal is applied.

Space For Rough Work

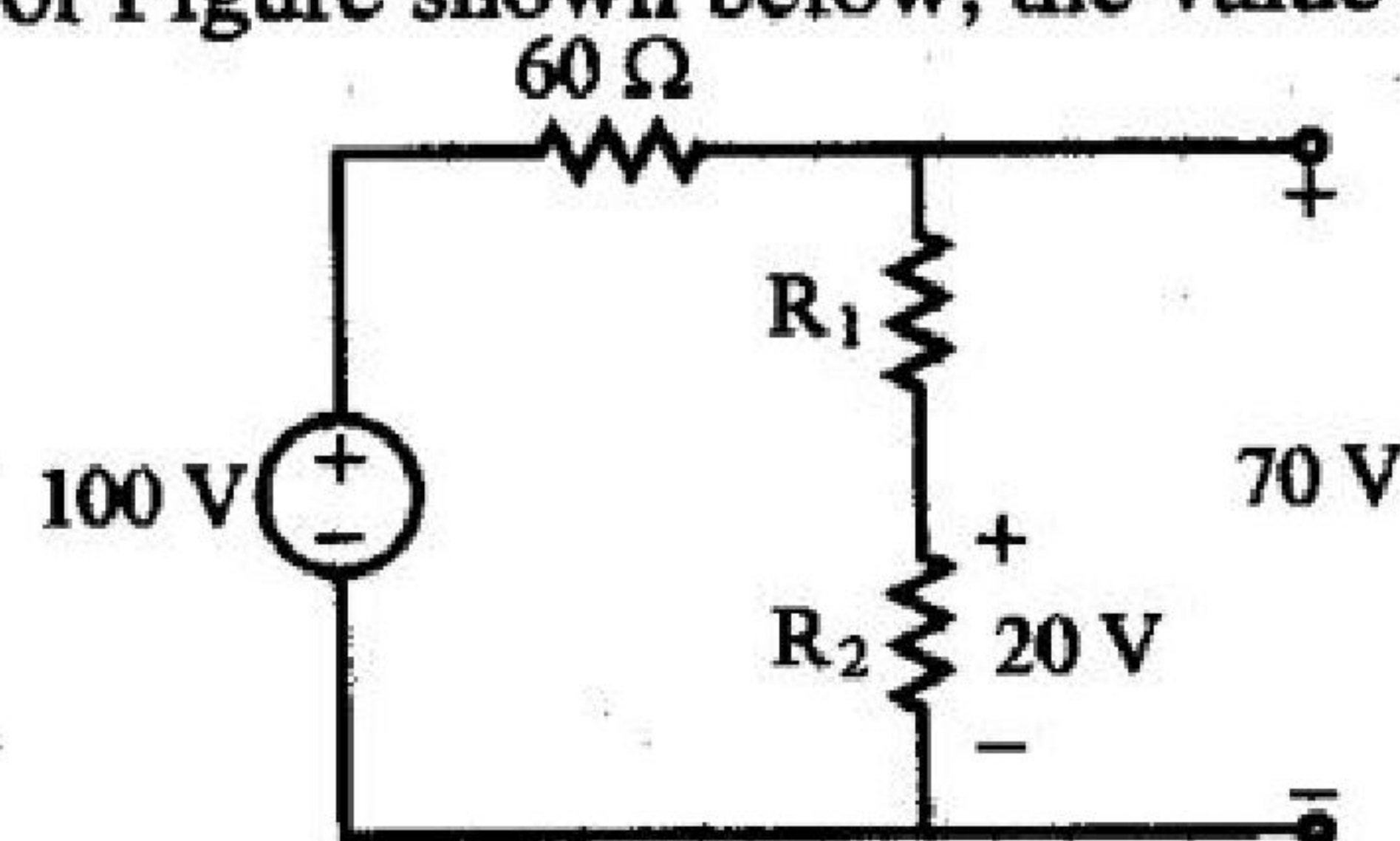
11. In IC technology, dry oxidation (using dry oxygen) as compared to wet oxidation (using steam or water vapour) produces
 (A) Superior quality oxide with a higher growth rate
 (B) Inferior quality oxide with a higher growth rate
 (C) Inferior quality oxide with a lower growth rate
 (D) Superior quality oxide with a lower growth rate
12. In case of bi-polar or static MOS memories, the access time is about
 (A) 20 to 400 ns (B) 20 to 400 μ s
 (C) 20 to 400 ms (D) 20 to 400 s
13. For the system having characteristic equation : $1 + \frac{k}{S(S+1)(S+2)} = 0$, the centroid of the asymptotes in root locus is given by
 (A) 0 (B) -1
 (C) 2 (D) -2
14. If the poles of the control system lie on the imaginary axis in the S-plane, the system will be
 (A) Stable (B) Unstable
 (C) Conditionally stable (D) Marginally stable
15. For 8085 microprocessor, the following program is executed
 MVI A, 05H;
 MVIB, 05H;
 PTR : ADD B;
 DCR B;
 JNZ PTR;
 ADI 03H;
 HLT;
 At the end of program, accumulator contains
 (A) 17 H (B) 20 H
 (C) 23 H (D) 05 H
16. The bit rate of a digital communication system is R kbits/s. The modulation used is 32-QAM. The minimum bandwidth required for ISI free transmission is
 (A) R/10 Hz (B) R/10 kHz
 (C) R/5 Hz (D) R/5 kHz

Space For Rough Work

17. The dominant mode in rectangular waveguide is TE_{10} , because this mode has
 (A) No attenuation (B) No cut-off
 (C) No magnetic field component (D) The highest cut-off wavelength
18. In an 8085 microprocessor system, the RST instruction will cause an interrupt
 (A) Only if an interrupt service routine is not being executed.
 (B) Only if a bit in the interrupt mask is made zero.
 (C) Only if the interrupts have been enabled by an EI instruction.
 (D) None
19. The matrix $\begin{bmatrix} 3-x & 2 & 2 \\ 2 & 4-x & 1 \\ -2 & -4 & -1-x \end{bmatrix}$ is singular if x is
 (A) (0, -3) (B) (0, 5)
 (C) (0, 3) (D) (0, -5)
20. The Eigen values of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$ are
 (A) -6, -1 (B) 1, 6
 (C) -1, 6 (D) -1, -5
21. $\lim_{x \rightarrow 0} \left(\frac{a^x + b^x + c^x}{3} \right)^{\frac{1}{x}}$ is equal to
 (A) $\sqrt{abc}$ (B) $2\sqrt{abc}$
 (C) $-\sqrt{abc}$ (D) $\sqrt[3]{abc}$
22. A unit normal vector to the surface $z = 2xy$ at the point (2, 1, 4) is
 (A) $2\hat{i} + 4\hat{j} - \hat{k}$ (B) $2\hat{i} + 4\hat{j} + \hat{k}$
 (C) $\frac{1}{\sqrt{21}}(2\hat{i} + 4\hat{j} - \hat{k})$ (D) $\frac{1}{\sqrt{21}}(4\hat{i} + 2\hat{j} - \hat{k})$

Space For Rough Work

23. A network has 7 nodes and 5 independent loops. The number of branches in the network is
 (A) 13 (B) 12
 (C) 11 (D) 10
24. An oscillator of the LC type that has a split capacitor in the circuit is
 (A) Hartley oscillator (B) Colpitts oscillator
 (C) Weinbridge oscillator (D) R-C phase shift oscillator
25. The address bus width of a memory of size 1024×8 bits is
 (A) 10 bits (B) 13 bits
 (C) 8 bits (D) 18 bits
26. Power factor of a pure inductor is
 (A) 0 (B) $1/\sqrt{2}$
 (C) 1 (D) $\sqrt{3}/2$
27. Gauss law relates the electric field intensity E with volume charge density ρ at a point as
 (A) $\nabla \times E = \epsilon_0 \rho$ (B) $\nabla \cdot E = \rho/\epsilon_0$
 (C) $\nabla \times E = \rho/\epsilon_0$ (D) $\nabla \cdot E = \epsilon_0 \rho$
28. The electric field strength at any point equals
 (A) the potential gradient at that point
 (B) negative of the potential gradient at that point
 (C) the charge at that point
 (D) negative of the charge at that point
29. The Laplace transform of a unit ramp function starting at $t = a$, is
 (A) $1/(s + a)^2$ (B) $e^{-as}/(s + a)^2$
 (C) e^{-as}/s^2 (D) a/s^2
30. In the circuit of Figure shown below, the value of R_1 will be



- (A) 25Ω (B) 50Ω
 (C) 100Ω (D) 2000Ω

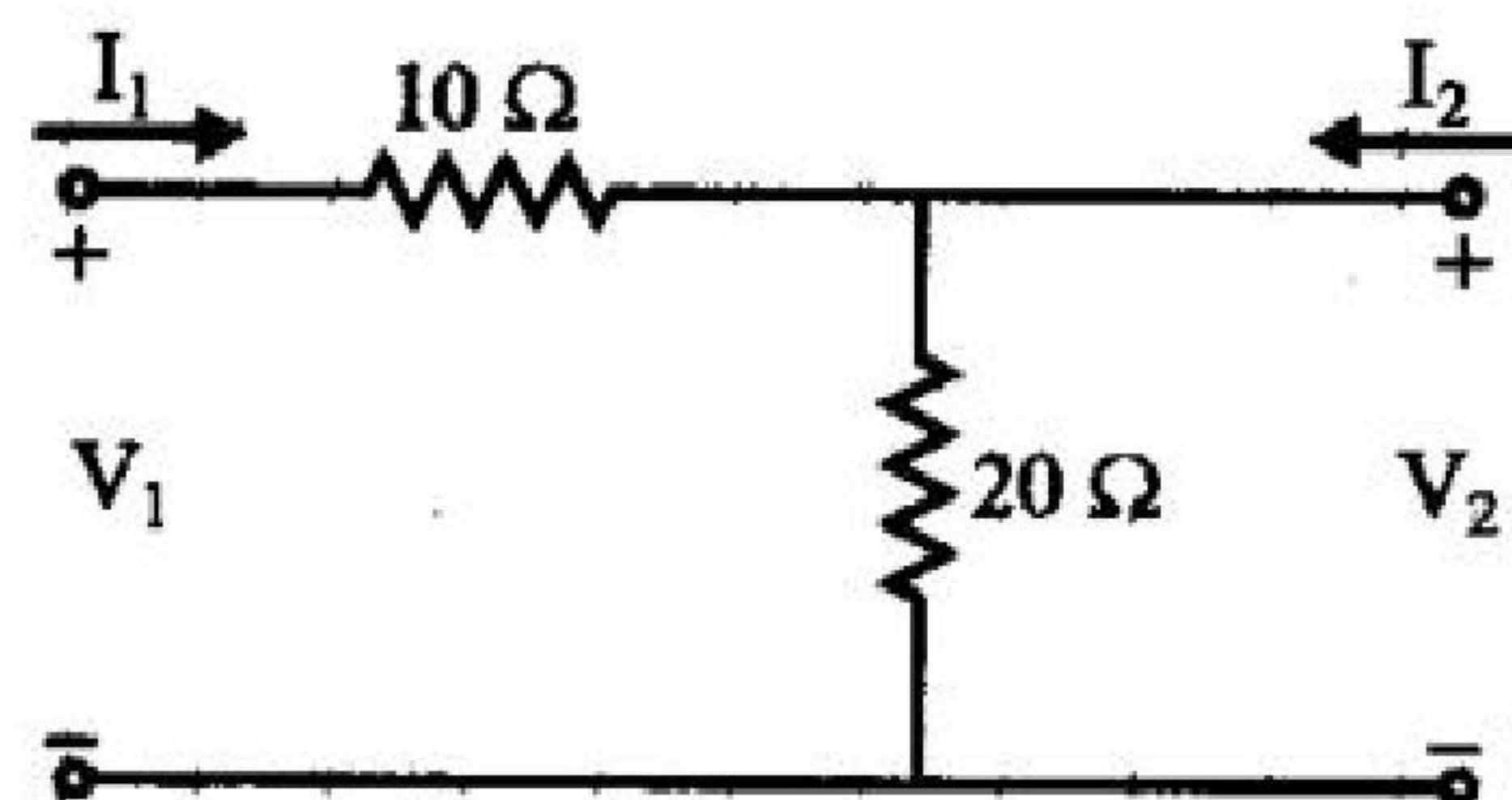
Space For Rough Work

SECTION – II

Each question carries *two* marks

(15 × 2 = 30)

31. The h-parameters of the circuit shown in Figure are



- (A) $\begin{bmatrix} 0.1 & 0.1 \\ -0.1 & 0.3 \end{bmatrix}$ (B) $\begin{bmatrix} 10 & -1 \\ 1 & 0.05 \end{bmatrix}$
- (C) $\begin{bmatrix} 30 & 20 \\ 20 & 20 \end{bmatrix}$ (D) $\begin{bmatrix} 10 & 1 \\ -1 & 0.05 \end{bmatrix}$

32. If the input to T-flip flop is 100 Hz signal, the final output of the three T-flip flops in cascade is

- (A) 1000 Hz (B) 500 Hz
- (C) 333 Hz (D) 12.5 Hz.

33. For the system described by the state equation $\dot{X} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0.5 & 1 & 2 \end{bmatrix} X + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} U$, if the control signal U is given by $U = [-0.5 \ -3 \ -5] X + V$, then the Eigen values of the closed loop system will be

- (A) 0, -1, -2 (B) 0, -1, -3
- (C) -1, -1, -2 (D) 0, -1, -1

Space For Rough Work

34. An amplifier has an open loop gain of 100, an input impedance of $1\text{ k}\Omega$ and an output impedance of $100\ \Omega$. A feedback factor with a feedback factor of 0.99 is connected to the amplifier in a voltage series feedback mode. The new input and output impedance respectively are
- (A) $10\ \Omega$ and $1\ \Omega$ (B) $10\ \Omega$ and $10\text{ k}\Omega$
 (C) $100\ \Omega$ and $1\ \Omega$ (D) $100\text{ k}\Omega$ and $10\text{ k}\Omega$
35. The minimized form of logical expression $\bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}BC + AB\bar{C}$ is
- (A) $\bar{A}\bar{C} + B\bar{C} + \bar{A}B$ (B) $A\bar{C} + \bar{B}C + \bar{A}B$
 (C) $\bar{A}C + \bar{B}C + \bar{A}B$ (D) $A\bar{C} + \bar{B}C + A\bar{B}$
36. In integrated circuits, NPN construction is preferred to PNP construction because
- (A) NPN construction is cheaper.
 (B) To reduce diffusion constant, n-type collector is preferred.
 (C) NPN construction permits higher packing of elements.
 (D) P-type base is preferred.
37. A ramp input applied to an unity feedback system results in 5% steady state error. The type number and zero frequency gain of the system are respectively
- (A) 1 and 20 (B) 0 and 20
 (C) 0 and $1/20$ (D) 1 and $1/20$
38. A resistor used in color TV has the following color bands: yellow, violet, orange and silver. Its nominal value is
- (A) $4.7\text{ kW} \pm 10\%$ (B) $4.7\text{ kW} \pm 5\%$
 (C) $47\text{ kW} \pm 10\%$ (D) $470\text{ kW} \pm 5\%$

Space For Rough Work

39. A class A transformer coupled transistor power amplifier is required to deliver a power output 10 Watts. The maximum power rating of the transistor should not be less than
- (A) 5 W
 - (B) 10 W
 - (C) 20 W
 - (D) 40 W
40. A carrier is phase modulated (PM) with frequency deviation of 10 kHz by a single tone frequency of 1 kHz. If the single tone frequency is increased to 2 kHz, assuming that phase deviation remains unchanged, the bandwidth of the PM signal is
- (A) 21 kHz
 - (B) 22 kHz
 - (C) 42 kHz
 - (D) 44 kHz
41. A second order system has a transfer function given by $G(S) = \frac{25}{s^2 + 8s + 25}$, if the system, initially at rest is subjected to a unit step input at $t = 0$, the second peak in the response will occur at
- (A) π sec
 - (B) $\pi/3$ sec
 - (C) $2\pi/3$ sec
 - (D) $\pi/2$ sec

Space For Rough Work

42. $L[t^2 e^t] =$

(A) $\frac{2}{(s-2)^2}$

(B) $\frac{2}{(s-2)^3}$

(C) $\frac{1}{(s-2)^3}$

(D) $\frac{1}{(s-1)^3}$

43. For a poisson variata x ; $P(x=1) = P(x=2)$, the mean of x is

(A) 3

(B) 4

(C) 2

(D) 1

44. If $e = 2.72$, $e^2 = 7.39$, $e^3 = 20.09$, $e^4 = 54.6$, then the value of $\int_0^4 e^x dx$ by Simpson's rule is

(A) 49.63

(B) 53.87

(C) 51.87

(D) 54.87

45. The following sequence of instructions are executed by 8085 microprocessor :

1000 LXI SP, 27FF

1003 CALL 1006

1006 POP H

The contents of the stack pointer (SP) and the HL register pair on completion of execution of these instructions are

(A) SP = 27FF, HL = 1003

(B) SP = 27FD, HL = 1003

(C) SP = 27FF, HL = 1006

(D) SP = 27FD, HL = 1006

Space For Rough Work

Note: Please choose to answer Part-B below corresponding to your basic degree

PART - B

(E & E: ELECTRICAL AND ELECTRONICS ENGINEERING)

SECTION-I

Each question carries one mark

(20 × 1 = 20)

46. The transient stability limit of the power system can be increased by introducing:
(A) Series Inductance (B) Shunt Inductance
(C) Series Capacitance (D) Shunt Capacitance
47. Leakage flux in a transformer depends on
(A) the applied voltage (B) the frequency
(C) the mutual flux (D) the load current.
48. The transformer noise is mainly because of
(A) cooling oil (B) sinusoidal current
(C) magnetic flux (D) all of the above
49. The purpose of retardation test on D.C. shunt machines is to find out
(A) Stray losses (B) Eddy current losses
(C) Field copper losses (D) Windage losses
50. The purpose of connecting snubber circuit connected across the SCR is to
(A) Suppress dv/dt (B) Increase dv/dt
(C) Decrease dv/dt (D) Decrease di/dt
51. Turn-off time of an SCR is measured from the instant
(A) Anode current becomes zero
(B) Anode voltage becomes zero
(C) Anode voltage and Anode current becomes zero
(D) Gate current becomes zero

Space For Rough Work

52. A resistor connected across the gate and cathode of an SCR in a circuit increases its
 (A) dv/dt rating (B) Holding current
 (C) Noise immunity (D) Turn-off time
53. The use of high speed breakers can
 (A) Increase the transient stability (B) Decrease the transient stability
 (C) Increase the steady state stability (D) Decrease the steady state stability
54. Which one of the following is true ?
 (A) Steady State Stability limit is greater than Transient Stability limit.
 (B) Steady State Stability limit is equal to Transient Stability limit.
 (C) Steady State Stability limit is less than Transient Stability limit.
 (D) None of the above.
55. In load flow analysis, the load connected at a bus is represented as
 (A) Constant current drawn from the bus
 (B) Constant impedance connected at the bus
 (C) Voltage and frequency dependent source at the bus
 (D) Constant real and reactive power drawn from the bus
56. Corona losses are minimized when
 (A) conductors size is reduced.
 (B) smooth conductor is reduced.
 (C) sharp points are provided in the line hardware.
 (D) current density in conductors is reduced.
57. The fuse current in amperes is related with fuse wire diameter D as
 (A) $I \propto 1/D$ (B) $I \propto D$
 (C) $I \propto D^{3/2}$ (D) $I \propto D^2$
58. Skin effect is proportional to
 (A) diameter of conductor (B) (diameter of conductor)^{1/2}
 (C) (diameter of conductor)² (D) (diameter of conductor)³

Space For Rough Work

59. Boosters are basically
- | | |
|------------------|-------------------------|
| (A) Inductors | (B) Capacitors |
| (C) Transformers | (D) Synchronous motors. |
60. Ash content of coal can be reduced by
- | | |
|------------------|---------------------------------|
| (A) Slow burning | (B) Washing |
| (C) Pulverizing | (D) Mixing with high grade coal |
61. Which loss occurs in the yoke of a DC machine ?
- | | |
|---------------|-----------------|
| (A) Iron loss | (B) Copper loss |
| (C) Heat loss | (D) No loss |
62. For the same rating, the cost of an induction motor as compared to that of a DC motor is
- | | |
|----------|---------------------|
| (A) More | (B) Less |
| (C) Same | (D) Nearly the same |
63. Inter poles in DC machines are provided to reduce
- | | |
|---------------|-----------------------|
| (A) Sparking | (B) Armature reaction |
| (C) Iron loss | (D) Efficiency. |
64. In case of induction motor, with increase in supply voltage, which of the following increases ?
- | | |
|------------------|-----------------------|
| (A) Power factor | (B) Slip |
| (C) Torque | (D) All of the above. |
65. In overhead transmission lines the effect of capacitance can be neglected when the length of line is less than
- | | |
|------------|------------|
| (A) 200 km | (B) 160 km |
| (C) 100 km | (D) 80 km |

Space For Rough Work

SECTION-II

Each question carries *two* marks

(10 × 2 = 20)

66. The efficiency of a transformer at full load 0.8 p.f. lag is 90%. Its efficiency at full load 0.8 lead will be
- (A) 90% (B) Less than 90%
(C) More than 90% (D) None of the above
67. Which of the following steps is likely to result in reduction of hysteresis loss in a D.C. generator ?
- (A) Providing laminations in armature core
(B) Providing laminations in stator
(C) Using non-magnetic material for frame
(D) Using material of low hysteresis co-efficient for armature core material
68. The Critical Clearance time of a fault in the power system is related to
- (A) Reactive power limit (B) Short circuit limit
(C) Steady state stability limit (D) Transient stability limit
69. On state voltage drop across thyristor used in a 230 V supply system is of the order
- (A) 110 – 115V (B) 250 V
(C) 1– 1.5 V (D) None of the above
70. A forward voltage can be applied to an SCR after its
- (A) Anode current reduces to zero
(B) Gate recovery time
(C) Reverse recovery time
(D) Anode voltage reduces to zero

Space For Rough Work

71. A fuse wire should have
- (A) Low specific resistance and high melting point
 - (B) Low specific resistance and low melting point
 - (C) High specific resistance and high melting point
 - (D) High specific resistance and low melting point.
72. The per unit impedance of a circuit element is 0.15. If the base kV and base MVA are halved, then the new value of the per unit impedance of the circuit element will be
- (A) 0.075
 - (B) 0.15
 - (C) 0.30
 - (D) 0.600
73. When bundle conductors are used in place of single conductors, the effective inductance and capacitance will respectively
- (A) Increase and decrease
 - (B) Decrease and increase
 - (C) Decrease and remain unaffected
 - (D) Remain unaffected and increase
74. In a single phase transformer which of the following relation is true ?
- (A) $E_1 N_1 = E_2 N_2$ and $I_1 N_1 = I_2 N_2$
 - (B) $E_1 N_2 = E_2 N_1$ and $I_1 N_1 = I_2 N_2$
 - (C) $E_1 N_2 = E_2 N_1$ and $I_1 N_2 = I_2 N_1$
 - (D) $E_1 N_1 = E_2 N_2$ and $I_1 N_2 = I_2 N_1$
75. 132/66kV electrical power transformer has its LV resistance 0.02 pu. The resistance when referred to HV side is
- (A) 0.02 p.u
 - (B) 0.04 p.u
 - (C) 0.01 p.u
 - (D) 0.08 p.u

Space For Rough Work

PART – B

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

SECTION – I

Each question carries one mark

(20 × 1 = 20)

46. The propagation delay T_{pd} of an IC is defined as
(A) the delay in charging the output capacitance
(B) the delay in input in changing from 0 to 1 and vice versa
(C) the delay that the circuit shows between its input and output
(D) the delay that the transistor creates in switching from one state to the other
47. The effect of current shunt feedback in an amplifier is to
(A) increase the input resistance and decrease the output resistance.
(B) increase both input and output resistances.
(C) decreases both input and output resistances.
(D) decrease the input resistance and increase the output resistance.
48. The term microelectronic refers to
(A) Electronic circuit using sub-miniature electron tubes
(B) Small circuits made by evaporation, silk screening, or semiconductor techniques
(C) Only monolithic integrated circuits
(D) Circuits using miniature discrete components
49. A major benefit of the Harvard architecture is
(A) Single word instructions execute more quickly than multiword instruction
(B) Code and data share memory and increase hardware efficiency
(C) Interrupt latency time is very predictable because instructions execute in a single cycle
(D) Code and data can be loaded into the CPU simultaneously on separate buses
50. A cross-compiler is used to
(A) convert high-level language code to assembler code
(B) convert one high level language to a different high-level language
(C) compile code for a target CPU that is different from the development CPU
(D) combine both high level language and assembler into a single module

Space For Rough Work

51. Decimal 43 in Hexadecimal and BCD number system is respectively
 (A) B2, 0100 0011 (B) 2B, 0100 0011
 (C) 2B, 0011 0100 (D) B2, 0100 0100
52. A system with an input $x(t)$ and output $y(t)$ is described by the relations : $y(t) = t x(t)$. This system is
 (A) Linear and time invariant (B) Linear and time varying
 (C) Nonlinear and time invariant (D) Nonlinear and time varying
53. A Hilbert transformer is a
 (A) Nonlinear system (B) Non causal system
 (C) Time varying system (D) Low pass system
54. Consider an angle modulated signal $x(t) = 6 \cos [2\pi 10^6 t + 2 \sin (800 \pi t)] + 4 \cos (800 \pi t)$. The average power of $x(t)$ is
 (A) 10 W (B) 18 W
 (C) 20 W (D) 28 W
55. At a given probability of error, binary coherent FSK is inferior to binary coherent PSK by
 (A) 6 dB (B) 3 dB
 (C) 2 dB (D) 0 dB
56. A half wavelength antenna has radiation resistance equal to
 (A) 700Ω (B) 300Ω
 (C) 73Ω (D) 47Ω
57. If the length of the antenna is increased, its directive gain
 (A) increases (B) decreases
 (C) become infinite (D) remains unchanged
58. An antenna with lower Q has
 (A) greater bandwidth (B) smaller bandwidth
 (C) higher distortion (D) lower distortion
59. A transmission line has a characteristic impedance of 50 ohm and a resistance of 0.1 ohm/m. If the line is distortion less, the attenuation constant (in Np/m) is
 (A) 500 (B) 5
 (C) 0.014 (D) 0.002

Space For Rough Work

60. A typical value of latching current to holding current in a 20 A thyristor is
(A) 5 (B) 2
(C) 1 (D) 0.5
61. Silicon-di-oxide layer is used in IC chips for
(A) providing mechanical strength to the chip
(B) diffusing elements
(C) providing contacts
(D) providing mask against diffusion
62. A Diffused resistor in an IC
(A) is formed along with the fabrication of transistors
(B) can be fabricated with precision for any resistor value
(C) is fabricated before transistor diffusion
(D) is fabricated after transistor diffusion
63. Overall cost of an IC
(A) is always dominated by the design cost
(B) is always higher than the corresponding discrete component assembly
(C) is continuously increasing
(D) is in general lower than the corresponding discrete component assembly
64. The photo-resist process is used
(A) during high temperature diffusion
(B) to prevent photo response
(C) to control the etching of SiO_2 from selected regions on a silicon slice
(D) to photograph the silicon slice
65. Thin film technology
(A) Is used for fabricating active components
(B) Uses silk screening
(C) Uses vapour deposition of a material on a substrate
(D) Produces components cheaper than by thick film technology

Space For Rough Work

SECTION – II

Each question carries *two* marks

(10 × 2 = 20)

66. Consider the following statements
- (i) Race around flip flop occur in a JK flip-flop where both the inputs are one.
 - (ii) A flip flop is used to store one bit of information.
 - (iii) A transparent latch consist in D flip flop.
 - (iv) Master slave configuration is used in flip flop to store in two bits of information.
- Which of these statements are correct ?
- (A) (i), (ii) and (iii) (B) (i), (iii) and (iv)
(C) (i), (ii) and (iv) (D) (ii), (iii) and (iv)
67. In QAM, both _____ of a carrier frequency are varied.
- (A) Frequency and amplitude (B) Phase and frequency
(C) Amplitude and phase (D) None of the above
68. An input $x(t) = \exp(-2t) u(t) + \delta(t-6)$ is applied to an LTI system with impulse response $h(t) = u(t)$. The output is
- (A) $[1-\exp(-2t)]u(t) + u(t+6)$ (B) $[1-\exp(-2t)]u(t) + u(t-6)$
(C) $0.5[1-\exp(-2t)]u(t) + u(t+6)$ (D) $0.5[1-\exp(-2t)]u(t) + u(t-6)$
69. The first six points of the 8-point DFT of a real valued sequence are 5, $1-j3$, 0, $3-j4$, 0, and $3+j4$. The last two points of the DFT are respectively.
- (A) 0, $1-j3$ (B) 0, $1+j3$
(C) $1+j3$, 5 (D) $1-j3$, 5
70. The Nyquist sampling interval, for the signal: $\text{sinc}(700t) + \text{sinc}(500t)$ is
- (A) $1/350$ sec (B) $\pi/350$ sec
(C) $1/700$ sec (D) $\pi/175$ sec
71. The peak to peak input to an 8-bit PCM coder is 2 Volts. The signal power to quantization noise power ratio (in dB) for an input of $0.5 \times \cos(\omega_m t)$ is
- (A) 47.8 (B) 49.8
(C) 95.6 (D) 99.6

Space For Rough Work

72. The decimal equivalent of the hexadecimal number $3E8_{16}$ is

- (A) 1000 (B) 982
(C) 768 (D) 323

73. The signal $x(t)$ is described by $x(t) = \begin{cases} 1 & \text{for } -1 \leq t \leq +1 \\ 0 & \text{otherwise} \end{cases}$ Two of the angular frequencies at which its Fourier transform becomes zero are

- (A) $\pi, 2\pi$ (B) $0.5\pi, 1.5\pi$
(C) $0, \pi$ (D) $2\pi, 2.5\pi$

74. The Boolean expression for the truth table shown is

A	B	C	f
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

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

75. In the following 8085 program how many times (decimal) is the DCR C executed ?

```

Loop: MVI C, 78H
      DCR C
      JNZ loop
      HLT
    
```

- (A) 119 (B) 120
(C) 78 (D) 77

Space For Rough Work

Note : Please choose to answer Part-B below corresponding to your basic degree

PART - B

(BME & ME: BIOMEDICAL ENGINEERING & MEDICAL ELECTRONICS)

SECTION – I

Each question carries *one* mark

(20 × 1 = 20)

46. As the bandwidth decreases, the resolution of an ultrasound image
(A) increases (B) decreases
(C) no change is seen (D) varies non linearly
47. Spin-spin relaxation is referred to as
(A) T-relaxation (B) T1-relaxation
(C) T2-relaxation (D) S-relaxation
48. An example for a scintillation crystal is
(A) NaI with thallium (B) HCl with thallium
(C) KIO₂ with thallium (D) Na with thallium
49. The period of function $\cos 3\pi/4(t-1)$ is
(A) 4/3 sec (B) 1/8 sec
(C) 8/3 sec (D) 3/8 sec
50. IIR filters are
(A) Non recursive type (B) Recursive type
(C) Neither recursive nor non recursive (D) None of these

Space For Rough Work

51. Number of butterflies needed for entire computation for $N = 8$ is
 (A) 8 (B) 12
 (C) 16 (D) 24
52. A discrete system has output-input relationship $y(n) = x(n) + 3$. The system
 (A) is linear (B) is causal
 (C) has bounded for bounded input (D) All of these
53. Huffman algorithm is one of the _____ algorithm.
 (A) Lossless (B) Lossy
 (C) Neither lossless nor lossy (D) None of these
54. Differentiation technique is used as one of the QRS detection technique based on
 (A) First derivative (B) Second derivative
 (C) First and second derivatives (D) None of these
55. Averaging 64 responses will improve the signal to noise ratio by what factor ?
 (A) 64 (B) 32
 (C) 16 (D) 8
56. If the output sequence of a digital filter is $\{1, 0, 0, 2, 0, 1\}$ in response to a unit impulse, then the transfer function of this filter $H(z) = Y(z)/X(z)$ is
 (A) $1 + z^{-3} + z^{-5}$ (B) $1 + 2z^{-3} + z^{-5}$
 (C) $1 + z^{-3} + 2z^{-5}$ (D) $2z^{-3} + z^{-5}$
57. In an image function $f(x, y)$, the range of $r(x, y)$ is
 (A) $[0, \infty]$ (B) $[-\infty, \infty]$
 (C) $[0, 1]$ (D) $[-1, 1]$
58. Which of the following image transform is input dependent ?
 (A) Walsh (B) Hadamard
 (C) Haar (D) Karhunen-Loeve

Space For Rough Work

59. _____ redundancy is associated with the characteristics of the human visual system
- (A) Interpixel (B) Coding
(C) Psychovisual (D) Temporal
60. The saturation component in HIS color model is
- (A) $1 - \frac{3}{(R + G + B)} [\min(R, G, B)]$ (B) $1 - \frac{3}{(R + G + B)} [\max(R, G, B)]$
(C) $\frac{1}{3}(R + G + B)$ (D) $(R + G + B)$
61. Pre-cordial leads also known as
- (A) avL, aVF, aVF (B) V1 – V6
(C) Chest leads (D) Both (B) and (C)
62. An electrode converts
- (A) Voltage in body to voltage in an amplifier
(B) Action potentials to digital signals
(C) Ionic current to electron current
(D) Reduction to oxidation reactions
63. An EEG measures
- (A) The coordinated activity of many neurons
(B) The action potential of a single neuron
(C) The cerebral vector describing the direction and magnitude of the brains electrical activity
(D) Communication between neurons in the brain and axons I the body
64. The blood pressure measurement usually performed by a doctor using the cuff and stethoscope is
- (A) Ultrasound (B) Oscillometric
(C) Auscultatory (D) Pulse transit time
65. The electrodes in the x-ray tube are sealed in
- (A) Tungsten (B) Vacuum
(C) Molybdenum (D) Xenon

Space For Rough Work

SECTION – II

Each question carries *two* marks

(10 × 2 = 20)

66. One among the two tomograms generated in ultrasonic tomography is due to
(A) Velocity (B) Acceleration
(C) Linearity (D) Phase
67. Due to a rotating mass with an electrical charge, the proton possesses
(A) Angular momentum
(B) Magnetic momentum
(C) Plane momentum
(D) None of these
68. The output of a linear system to a unit step input $u(t)$ is $t^2 e^n$. The system function $H(S)$ is
(A) $2/S^2(S+2)$ (B) $2/(S+2)^2$
(C) $2/(S+2)^3$ (D) $2S/(S+2)^3$
69. The discrete time equation $y(n+1) + 0.5ny(n) = 0.5x(x+1)$ is not attributable to a
(A) Memoryless system (B) Time varying system
(C) Linear system (D) Causal system
70. If the sampling frequency is 360 Hz located zero at 60° , at what frequency it eliminates?
(A) 120 Hz (B) 30 Hz
(C) 60 Hz (D) 180 Hz
71. The convolution between the two sequences $x[n] = \{1, 4, 2\}$ and $h[n] = \{1, 1, 1, 1\}$ is
(A) $\{1, 3, 7, 7, 6, 1\}$ (B) $\{1, 5, 7, 7, 6, 2\}$
(C) $\{1, 3, 7, 6\}$ (D) $\{1, 1, 1, 1\}$

Space For Rough Work

72. The smallest discernible change in gray level is called _____ and the effect caused by the insufficient number of gray levels is called _____
- (A) false contouring, gray level resolution
(B) spatial resolution, thresholding
(C) gray level resolution, false contouring
(D) false contouring, spatial resolution
73. The general image compression model consists as per the ordering
- (A) input, decoder, channel, encoder, output
(B) input, encoder, channel, decoder, output
(C) input, decoder, encoder, channel, output
(D) input, encoder, decoder, channel, output
74. What is the mean corpuscular volume in blood with PCV = 45% and RBC count = 5.0 millions/mm³
- (A) 40 cubic microns (B) 60 cubic microns
(C) 80 cubic microns (D) 90 cubic microns
75. What is the shortest λ of x-rays produced in a x-ray tube with accelerating potential of 70kV ?
- (A) 0.017 (B) 0.018
(C) 0.019 (D) 0.015

Space For Rough Work

Note : Please choose to answer Part-B below corresponding to your basic degree

PART – B

(IT: INSTRUMENTATION TECHNOLOGY)

SECTION – I

Each question carries *one* mark

(20 × 1 = 20)

- 46.** Piezo-electric accelerometers
- (A) should not be used for frequencies for high above 100 Hz.
 - (B) should be used for low frequencies
 - (C) should use a monitoring source of low input impedance
 - (D) have a low natural frequency
- 47.** One of the method to measure power output of a radio transmitter while it is radiating is
- (A) Electro static meter
 - (B) Three Wattmeter method
 - (C) Three ammeter method
 - (D) Two watt meter method
- 48.** If spring of a transducer deflects 0.04 m when subjected to a force of 8kN, then the spring sensitivity will be
- (A) 4/8 m/kN
 - (B) 0.005 m/kN
 - (C) 0.05 m/kN
 - (D) 0.5 /kN
- 49.** The process of constructing models from experimental data is called
- (A) system modification
 - (B) system compression
 - (C) system conversion
 - (D) system identification
- 50.** Limit cycles are unique features of
- (A) linear systems
 - (B) non linear systems
 - (C) time variant systems
 - (D) time independent systems

Space For Rough Work

51. Non invasive device that measures impulses from eyes and ears to record blood flow between heart and brain is
 (A) Doppler flowmeter (B) echoencephalograph
 (C) oculo plethysmograph (D) electrode contact analyzer
52. In nuclear instrumentation, heaviest and flow moving particles are
 (A) beta particles (B) alpha particles
 (C) gamma rays (D) protons
53. x-ray electromagnetic radiation lie in the range
 (A) $2.5 \mu\text{m}$ to $25 \mu\text{m}$ (B) 400 nm to 700 nm
 (C) 0.1 mm to 1 mm (D) 10 nm to 100 nm
54. Interferometer is used for
 (A) wavelength dispersion (B) magnifying power
 (C) flatness measurement (D) none
55. He-Ne laser has wavelength
 (A) 514.5 nm (B) 632.8 nm
 (C) $1.06 \mu\text{m}$ (D) $10.6 \mu\text{m}$
56. The impulse response of an R-L circuit is a
 (A) rising exponential function (B) decaying exponential function
 (C) step function (D) parabolic function
57. Sinusoidal signal $x(t) = 4\cos(200t + \pi/6)$ is passed through a square law device defined by the input output relation $y(t) = x^2(t)$. The DC component in the signal is
 (A) 3.46 (B) 4
 (C) 2.83 (D) 8
58. Energy of the signal $A\delta[n]$ is
 (A) A^2 (B) $A^2/2$
 (C) $A^2/4$ (D) 0

Space For Rough Work

59. Fourier series of an odd periodic function contains only
(A) odd harmonics (B) even harmonics
(C) cosine terms (D) sine terms
60. FIR filters are
(A) non recursive type
(B) recursive type
(C) neither recursive nor non recursive
(D) none of these
61. In modern measurement systems undesirable static characteristics are
(A) dead zone (B) drift
(C) static error and non linearity (D) all of these
62. In AC circuits, the connection of measuring instruments causes loading errors which may affect the measurand's ?
(A) Magnitude (B) Phase
(C) Waveform (D) all of these
63. The first order thermometer used has a time constant of 50sec. If it is subjected to a sinusoidal input at cycling of 0.002Hz, then time lag produced in the instrument will be
(A) 0.02 sec (B) 22.3 sec
(C) 44.6 sec (D) 50 sec
64. Accuracy is specified as $\pm 0.5\%$ of true value. At 5% of full scale, error of the instrument will be
(A) $\pm 0.025\%$ (B) $\pm 0.5\%$
(C) $\pm 2.5\%$ (D) $\pm 25\%$
65. A Linear Variable Differential Transformer (LVDT) is
(A) a displacement transducer (B) an impedance matching transformer
(C) a differential temperature sensor (D) an Auto transformer

Space For Rough Work

SECTION – II

Each question carries *two* marks

(10 × 2 = 20)

66. Given $F(z) = Z^3 - 1.25Z^2 - 1.37Z - 0.25 = 0$, find the number of roots outside the circle
- (A) Zero (B) One
(C) Two (D) None
67. Which of the following is performance measure for minimum fuel problem in optimal control system
- (A) $\int_{t_0}^{t_f} (X^T Q X + U^T R U) dt$ (B) $\int_{t_0}^{t_f} dt$
(C) $\int_{t_0}^{t_f} |u| dt$ (D) $\int_{t_0}^{t_f} U^2 dt$
68. Z Transform can be obtained from Laplacian transform $F(s)$ by residual method as $F(z) =$
- (A) $\sum_{\text{poles of } F(z)} \text{Residue of } F(z) Z/(Z - e^{T/r})$
(B) $\sum_{\text{poles of } F(z)} \text{Residue of } F(z) Z/(Z - e^{Tr})$
(C) $\sum_{\text{poles of } F(z)} \text{Residue of } F(z) Z/(Z - e^{-Tr})$
(D) $\sum_{\text{poles of } F(z)} \text{Residue of } F(z) Z/(Z - e^{-Tr})$
69. What is cardiac output when 20 mg of indicator was injected and average concentration as calculated for curve was 10 mg/l for 20S
- (A) 4l/m (B) 4.5l/m
(C) 6l/m (D) 5l/m

Space For Rough Work

70. Spectrophotometer uses
- (A) Selection filter (B) Silver wire
(C) monochromator (D) chloridmeter
71. What is the shortest λ of X-ray produce in X ray tube with accelerating potential of 70kV
- (A) 0.0018 nm (B) 0.0017 nm
(C) 0.0019 nm (D) 0.0015 nm
72. Fourier transform of $V(t)\cos\omega_0 t$ is
- (A) $V(t) = \frac{1}{2} [\delta(f-f_0)]$ (B) $V(t) = \frac{1}{2} [\delta(f-f_0) - \delta(f + f_0)]$
(C) $V(t) = \frac{1}{2} [\delta(f+f_0)]$ (D) $V(t) = \frac{1}{2} [\delta(f-f_0) + \delta(f + f_0)]$
73. The basic process that goes on inside DSP chip is
- (A) Quantization (B) Log transform
(C) Vector calculation (D) MAC
74. A venturi flow meter is built in rectangular channel of 1m wide. It has a throat width of 400 mm. The upstream head is 570 mm and measured head in throat is 500 mm. find the discharge through the venturi meter
- (A) $0.11\text{m}^3/\text{s}$ (B) $0.22\text{m}^3/\text{s}$
(C) $0.33\text{m}^3/\text{s}$ (D) $0.44\text{m}^3/\text{s}$
75. A force digital transducer measure pressure in range 0-200N with resolution of 0.1% of full scale. The smallest change in measurement is
- (A) 0.2N (B) 0.1N
(C) 1N (D) 2N

Space For Rough Work

A-2