M.Tech. Common Entrance Test, PGCET – 2010

Electrical Sciences
(EE/EC/TC/BM/ML/IT)

Time: 2 Hours   Max. Marks: 100

Read the following instructions before answering the test

i)   Write / darken the particulars of your identity, Test Seat Number and affix your signature on the OMR Response Sheet before the start of the test.

ii)   All Questions have multiple choices of answers, of which only one is correct.

iii) Mark the correct answer by completely darkening only one oval against the Question number using Black Ink Ball Point pen only.

iv)   There will be no negative evaluation with regard to wrong answers. Marks will not be awarded if multiple answers are given.

v)   Do not make any stray mark on the OMR Response sheet. For rough work, use blank page on the Question paper.

vi)   Taking the Question paper out of the test hall is permitted only after the full duration of the test.

vii) Use of only non-programmable calculator is permitted.

viii) START ANSWERING ONLY AT THE SPECIFIED TIME WHEN THE INVIGILATOR GIVES INSTRUCTIONS.

MARKS DISTRIBUTION

PART – A

Section – I	30 Questions :	30 x 1 = 30 Marks
Section – II	15 Questions :	15 x 2 = 30 Marks

PART – B

Section – I	20 Questions :	20 x 1 = 20 Marks
Section – II	10 Questions :	10 x 2 = 20 Marks
		Total = 100 Marks

PART – A

(Common to EE/EC/TC/BM/ML/IT)
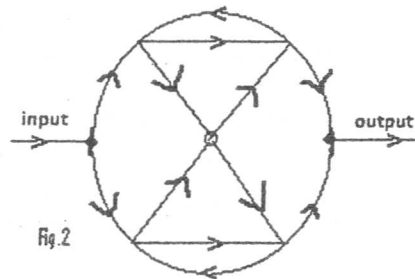
SECTION – I of PART – A

. **Each question carries One Mark** **30 x 1 = 30 Marks**

1. The Transfer function of a system with time delay expressed by the differential equation
    $\frac{d}{dt}y(t) + y(t) = u(t-T)$ is given by

    a. $\dfrac{e^{-sT}}{s+1}$.
    b. $\dfrac{(s-1)}{(s+1)}$
    c. $\dfrac{-se^{-sT}}{(s+1)}$
    d. $\dfrac{(s+1)}{(s-1)}$

2. The signal flow graph shown in Fig.2 has M number of forward paths and P number of
    individual loops then

    Fig.2

    a. M = 6, P = 6 b. M = 6, P = 4 c. M = 4, P = 6 d. M = 4, P = 4

3. Gain margin for a system with $GH(j\omega) = \dfrac{1}{(j\omega+1)^3}$ is

    a.2 b. 4 c. 6 d. 8

4. The rise time T_r for $c(t) = 1 - e^{-t}$ is given by

   a. 1.198 b. 2.198 c. 2.298 d. 3.298

5. The h-parameter for a two-port network are $[h] = \begin{bmatrix} 9\Omega & -2 \\ 20 & 0.2s \end{bmatrix}$. The new h-parameter that
    results if 1Ω resistor is connected in series with the input is

    a. $\begin{bmatrix} 10\Omega & -2 \\ 20 & 0.2s \end{bmatrix}$
    b. $\begin{bmatrix} 10\Omega & -3 \\ 2 & 0.2s \end{bmatrix}$
    c. $\begin{bmatrix} 10\Omega & -2 \\ 21 & 0.2s \end{bmatrix}$
   d. $\begin{bmatrix} 10\Omega & -2 \\ 21 & 0.3s \end{bmatrix}$

6. The value of H for a solid cylindrical conductor of radius 'a' with the current ' I ' being
    uniformly distributed over the cross section is

    a. $\left(\dfrac{1}{2\pi r}\right)a_\varphi$
    b. $\left(\dfrac{1}{4\pi r}\right)a_\varphi$
    c. $\left(\dfrac{2}{\pi r}\right)a_\varphi$
    d. $\left(\dfrac{1}{\pi r}\right)a_\varphi$

7. The number of poles P_0 enclosed by the complex- plane contour of Fig.7 with $Z_a = 0$ is equal to

Fig.7
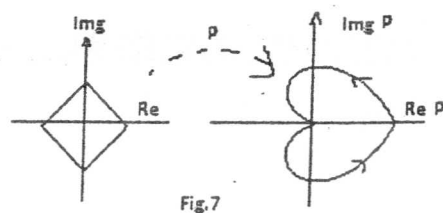
   a. 0   b. -1   c. 1   d. 2

8. A soft error in DRAM

   a. cannot be recovered   b. cannot be corrected
   c. can be recovered by reprogramming   d. none of the above

9. Flip flop is an

   a. active device   b. passive device   c. inactive device   d. none of the above

10. The Thevenin's equivalent for the network in Fig.10

Fig.10
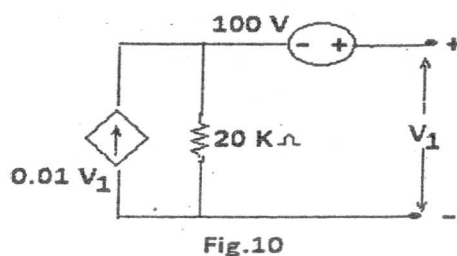
   a. -502.5mV, -100.5Ω b. - 502.5mV, 100.5Ω
   c. 502.5mV, -100.5Ω d. 100.5 mV, 502.5Ω

11. The loaded voltage gain of an amplifier is always

   a. equal to no-load gain   b. more than no-load gain
   c. less than no-load gain   d. none of the above

12. The resistance R_{AB} at the terminals AB in Fig.12 if R = 1kΩ is given by
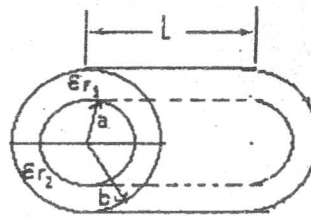

Fig.12
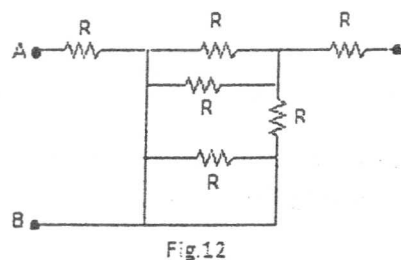
   a. $\frac{4}{3}k\Omega$ b. 1kΩ c. $\frac{3}{4}k\Omega$ d. $\frac{7}{4}k\Omega$

13. The output voltage of the opamp shown in Fig. 13 has a value

Fig.13
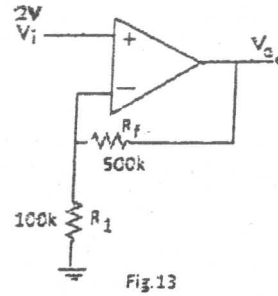
    a. -12V   b. 10V   c. 12V   d. 24V

14. The high and low cut-off frequencies of an amplifier can be determined by the response of the system to

a. sinusoidal input   b. square wave input
c. triangular wave input   d. pulsed input

15. The number of machine cycles and T states required for execution of STA instruction are

    a. (3, 12)   b. (4, 12)   c. (4, 13)   d. (3, 13)

16. The capacitance of a cylindrical capacitor of length 'L' and each dielectric occupies one half of the volume shown in Fig.16 is

Fig.16

a. $\dfrac{4\pi \in_0 (\varepsilon_{r1} + \varepsilon_{r2})L}{\ln\dfrac{b}{a}}$ b. $\dfrac{\pi \in_0 (\varepsilon_{r1} + \varepsilon_{r2})L}{\ln\dfrac{b}{a}}$ c. $\dfrac{8\pi \in_0 (\varepsilon_{r1} + \varepsilon_{r2})L}{\ln\dfrac{b}{a}}$ d. $\dfrac{2\pi \in_0 (\varepsilon_{r1} + \varepsilon_{r2})L}{\ln\dfrac{b}{a}}$

17. The logic function $y = \bar{A}(\bar{B} + C) + A\bar{B}C$ can be expressed in its simplest form

a. $y = \bar{A}(\bar{B} + C) + A\bar{B}C$ b. $y = \bar{B}(\bar{A} + C) + \bar{A}C$

c. $y = \bar{A}(\bar{A} + C) + B\bar{A}C$ d. $y = \bar{A}(\bar{B} + \bar{C}) + A\bar{B}$

18. The program to load the flag register contents to C register is

a LXI SP, 27FCH	b. LXI SP, 27FCH	c. LXI SP, 27FFH	d. LXI SP, 27FEH
PUSH PSW	PUSH PSW	PUSH PSW	PUSH PSW
POP B	POP D	POP B	POP B

19. The following program results in

    LXI SP, 27FEH
    PUSH B
    PUSH D
    POP B
    POP D

    a. exchanges contents of BC and DE   b. stores original contents of BC and DE in stack
    c. exchanges contents of BD and CE   d. stores contents of only BC in DE

20. The following is not a vectored interrupt

    a. TRAP   b. RST 5.5   c. INTR   d. RST 7.5

21. . The vector address for RST4 is

    a. 0018H   b. 0020H   c. 0028H   d. 0030H

22. The control word for 8255 in mode1 with Port A as input port is
   a. 10111   b.11101   c.01110   d. 11011

23. In order to get correct answer when two numbers are added in Excess- 3 code and sum is less than 9, it is necessary to
    a. To subtract 0011 from the sum   b. to add 0011 to the sum
    c. To subtract 0110 from the sum   d. to add 0011 to the sum

24. The open loop gain of an amplifier is 100. If negative feedback with $\beta = 0.1$ is used the closed loop gain will be
    a. 111.1   b. 90.9   c. 0.09   d. none of these

25. The following circuit converts a JK Flip Flop into a T Flip Flop.
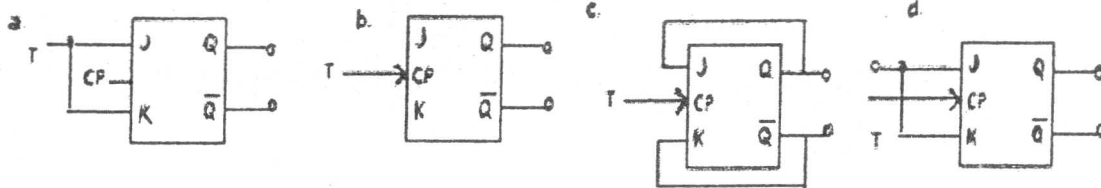
26. The efficiency of a transformer –coupled Class A amplifier for a supply of 12 V and Output of 6V is
    a. 50%   b. 12.5%   c.1.39%   d. 0.26%

27. The quality factor Q of a piezoelectric crystal has a typical value of
    a.5000   b.1000   c. 10,000   d. 20,000

28. At time $t = 0^+$ with zero initial condition, the following element acts as a open circuit
    a. inductor   b. capacitor   c. resistor   d. all of these

29. $H(s) = \dfrac{v(s)}{I(s)} = \dfrac{4s+6}{s+2}$ when i(t) is a unit step function as t tends to infinity is given by the value of v(t) is

    a. 0   b. 3   c. 4   d. ∞

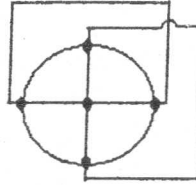**30.** The number of branches and nodes in the given graph Fig.30 are

Fig.30

    a. (5,10)   b. (8,5)   c. (10,5)   d. (6,10)

(Common to EE/EC/TC/BM/ML/IT)

SECTION – II of PART – A

Each question carries Two marks   **15 x 2 = 30 Marks**

31. Resonance peak M_p and resonant frequency ω_p for the system $\dfrac{C(s)}{R(s)} = \dfrac{s}{(s^2 + 2s + 1)}$ are

    a. $\dfrac{3}{4}, \pm\sqrt{3}$ b. $\dfrac{1}{2}, \pm\sqrt{2}$ c. $\dfrac{1}{4}, \pm\sqrt{3}$ d. $\dfrac{5}{4}, \pm\sqrt{3}$

32. The departure angle of the root locus from pole at s =-10+j10 for $GH = \dfrac{K(s+8)}{(s+14)(s+10+j\omega)(s+10-j10)}$ for K > 0 is

    a. 132°   b. 124°   c. 72°   d. 66°

33. The transfer function of a minimum phase system with Bode plot shown in Fig. , is

Fig.

    a. $G(j\omega) = \dfrac{100\left(1+\dfrac{j\omega}{2}\right)\left(1+\dfrac{j\omega}{10}\right)}{j\omega}$ b. $G(j\omega) = \dfrac{10\left(1+\dfrac{j\omega}{2}\right)\left(1+\dfrac{j\omega}{10}\right)}{\dfrac{j\omega}{2}}$
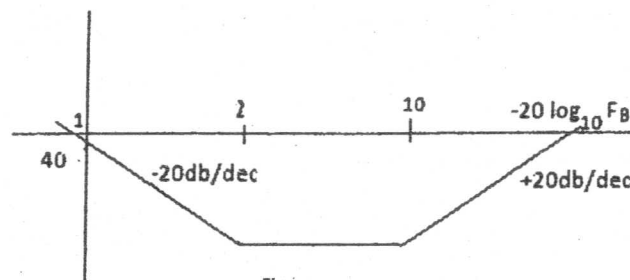
    c. $G(j\omega) = \dfrac{\left(1+\dfrac{j\omega}{2}\right)\left(1+\dfrac{j\omega}{10}\right)}{j\omega}$ d. $G(j\omega) = \dfrac{100\left(1+\dfrac{j\omega}{2}\right)\left(1+\dfrac{j\omega}{10}\right)}{\dfrac{j\omega}{2}}$

34. The closed loop transfer function of the system represented by the state model is given by

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -3 \end{bmatrix} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} \dfrac{40}{3} \\ -15 \\ \dfrac{5}{3} \end{bmatrix} U \quad \text{and} \quad [Y] = \begin{bmatrix} 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

a. $\dfrac{10(s+4)}{s(s+1)(s+3)}$ b. $\dfrac{20(s+4)}{s(s+1)(s+3)}$ c. $\dfrac{-5(s+4)}{s(s+1)(s-3)}$ d. $\dfrac{-15(s+4)}{s(s+1)(s-3)}$

35. The minimum cost POS expression for the function $f(x_1,x_2,x_3) = \Sigma m(1,2,3,5)$ is

a. $f = (\overline{x_1} + \overline{x_2})(x_2 + x_3)$

c. $f = (\overline{x_1} + \overline{x_3})(x_2 + x_3)$

b. $f = (\overline{x_1} + \overline{x_2})(x_1 + x_3)$

d. $f = (\overline{x_3} + \overline{x_2})(x_2 + x_3)$

36. The following program in 8253/54 with control register address=0BH,counter 0=08H, counter 1=09H and counter 2=0AH.

    MVI   A, B 0H
    Out   0BH
    MVI   A, low byte (30H)
    Out   0AH
    MVI   A, high byte (C0H)
    Out   0AH

a. Initializes Counter 2 in mode 0 with a count of C030H

b. generates a square wave of 1kHz

c. generates a real time clock

d. provides a delay of 5 secs

37. The following set of instruction checks

    RIM
    ANI 10 H
    CNZ 002CH

a. RST 7.5 is pending

c. disables RST 5.5

b. RST 5.5 is individually masked

d. RST5.5 is pending

38. The value of the capacitors C_1 and C_2 in a Wein bridge oscillator in Fig38 for $f_0 = 10khz$ are
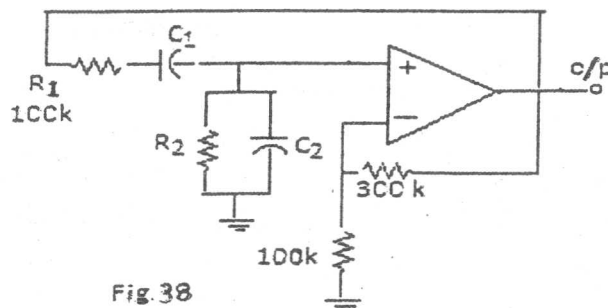

Fig. 38

a. (159pF,159pF) b. (159μF,159μF) c. (169pF,159pF) d. (150mF,169mF)

39. The value of (V_{CEQ}, I_E) for the circuit in Fig39 is given by

Fig39 $V_{EE} = -20\,V$
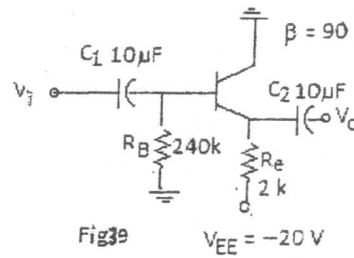
a. (11.68mV, 4.12mA)   b. (10.68mV, 45.73μA)

c. (20.63mV, 4.16μA)   d. (11.68V ,4.16mA)

40. The Port address and mapping scheme for Fig.40 are

$E_1 E_2$ active low   Fig40
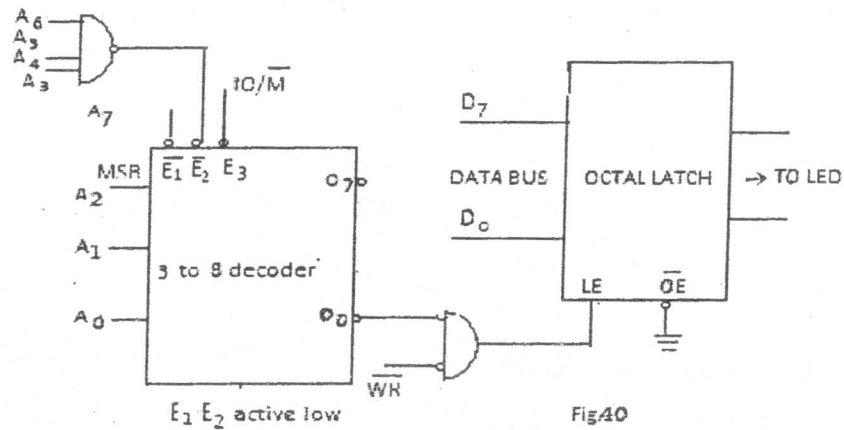
a. I/O mapped I/O,78H   b. Memory mappedI/O, 78 H
c. I/O mapped I/O,68H   d. Memory mappedI/O, 88 H

41. The magnitude of current i_1 in the circuit shown in Fig41 is

Fig41 $7\,\Omega$
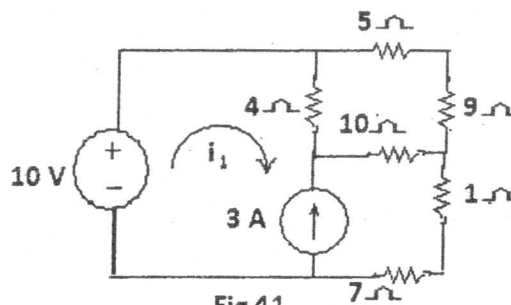
a. 1.93 A   b. - 2.93 A   c. - 1.93 A   d. 2.93 A

ES-7

42. The output waveform of the circuit in Fig42 for a sinusoidal input of peak 50V is

Fig. 12

a.

b.

c.

d.
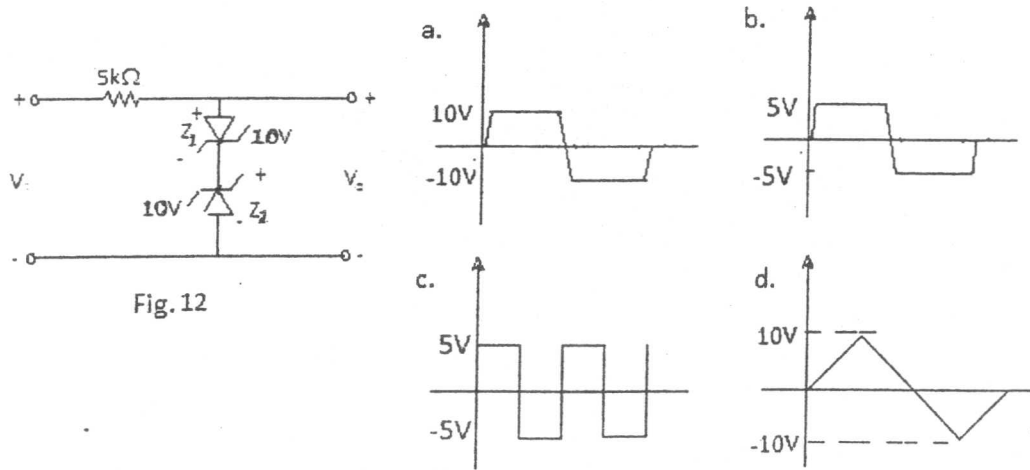
43. The value of the inductance ' L ' for a resonant frequency of 1MHz for the circuit in Fig43 is

Fig.43
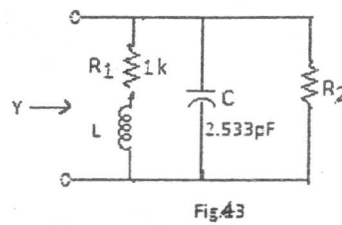
a. 1mH   b. 0.1mH   c. 100mH   d. 10mH

44. The function implemented by the multiplexer chip of fig.44 is

Fig.44
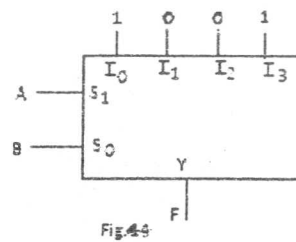
a. $F(A, B) = A \oplus B$ b. $F(A, B) = A \odot B$

c. $F(A, B) = \overline{A} B$ d. $F(A, B) = \overline{A} B + AB$

45. The **voltage** V_{AB} for the circuit in Fig45 is given by
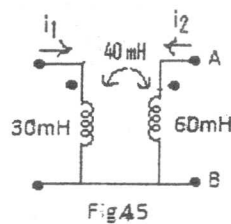
Fig45

a. 13.33 cos1000t   b. 13.33 sin1000t   c. 23.33 cos100t   d. 13.33 cos100t

PART – B
(EE: ELECTRICAL AND ELECTRONICS ENGINEERING)
SECTION – I OF PART – B

Each Question Carries One Mark   **20 x 1 = 20 Marks**

46. Fleming's left hand rule is applicable to
     (a) dc generator   (b) dc motor   (c)alternator   (d) transformer

47. Neglecting all losses, the developed torque (T) of a DC separately excited motor, operating under
     constant terminal voltage, is related to its output power (P) as under
     (a) $T \alpha \sqrt{P}$ (b) $T \alpha P$ (c) $T^2 \alpha P^3$ (d) T is independent of P

48. The speed regulation of a dc motor is given as
     (a) $N_o - N_f$ (b) N_o / N_f (c) $(N_o - N_f)/N_f$ (d) $(N_o - N_f)/N_o$

49. The efficiency of a power transformer is around
     (a) 50%   (b) 60%   (c) 80%   (d) 95%

50. If rated dc voltage is applied instead of ac to the primary of a transformer
     (a) secondary of transformer will burn   (b) primary of transformer will burn
   (c) secondary voltage will be excessively high.(d) there will be no secondary voltage.

51. If the applied voltage of a certain transformer is increased by 50% and the frequency is reduced to
     50% (assuming that the magnetic circuit remains unsaturated), the maximum core flux density will
     (a) change to three times the original value   (b) change to 1.5 times the original value
     (c) change to 0.5 times the original value   (d) remain the same as the original value.

52. Core loss in a transformer is usually
     (a) 1% to 3%   (b) 10% to 15%   (c) 25% to 30%   (d) 40% to 50%

53. In a synchronous machine, if the field flux axis is ahead of the armature field axis in the direction
     of the rotation, the operating machine is a
     (a) synchronous motor   (b) synchronous generator
     (c) asynchronous motor   (d) asynchronous generator

54. Variation in dc excitation of a synchronous motor causes variation in
     (a) speed of motor   (b) power factor
     (c) armature current   (d) both (b) and (c).

55. Feeder is designed mainly from the point of view of
    (a) its current carrying capacity   (b) voltage drop in it
    (c) operating voltage   (d) operating frequency

56. In a transmission system, the weight of copper used is proportional to
    (a) E^2 (b) E   (c) $1/E^2$ (d) $1/E$

57. In a vacuum circuit breaker , the vacuum is of the order of
    (a) 1 torr   (b) 10^{-6}torr   (c) 10^{-12}torr   (d) 10^{-16}torr

58. At a room temperature of $30\ ^0$C, minimum voltage and current required to fire a SCR is
    (a) 3V, 40mA   (b) 0.6V, 40 mA   (c) no limit   (d) 3V, 100mA

59. A loss less line terminated with its surge impedance has
    (a) flat voltage profile
    (b) transmission line angle greater than actual length of line
    (c) transmission line angle less than the actual length
    (d) both (a) and (b)

60. 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 drawn from the bus

61. The unit protection scheme provides
    (a) primary protection   (b) backup protection
    (c) simultaneous protection   (d) remote protection

62. The steady state stability limit of a synchronous generator can be increased by
    (a) an increase in its reactance
    (b) an increase in the excitation of the machine
    (c) a decrease in the moment of inertia of the machine
    (d) an increase in the moment of inertia of the machine

63. The plant ^{e} suitable for peak load is
    (a) Diesel engine plant   (b)Steam power plant
    (c)Nuclear power plant   (d)Hydro-electric plant

64. The recovery voltage will be maximum for power factor of
    (a) zero   (b) 0.5   (c) 0.707   (d) unity

65. The extremely high input impedance of a MOSFET is primarily because of
    (a) absence of its channel
    (b) depletion of current carriers
    (c) extremely small leakage current of its gate capacitor
    (d) -ve V_{GS}

Each Question Carries Two Marks   **10 x 2 = 20 Marks**

66. The armature resistance of a 6 pole lap wound dc machine is 0.05Ω. If the armature is rewound using a wave winding then the armature resistance will be
(a)0.45   (b) 0.30   (c) 0.15   (d)0.10

67. A dc shunt generator having a shunt field of 50 Ω was generating normally at 1000 rpm, the critical resistance of the machine was 80 Ω . Due to some reasons the speed of the prime mover became such that the generator just failed to generate. The speed at that time must have been
(a) 1600 rpm   (b) 800 rpm   (c) 625 rpm   (d) 500rpm

68. 1 KVA, 230V, 50 Hz, single phase transformer has an eddy current loss of 30 watts. The eddy current loss when the transformer is excited by a dc source of same voltage will be
(a) 30 watts   (b) more than 30 W   (c) less than 30 watts (d) Zero watt

69. If the percentage resistance of a power transformer for secondary side is 2.5 percent and turn ratio is 1:10, the percentage secondary resistance referred to primary will be
(a) 25   (b) 2.5   (c) 0.25   (d) 0.025

70. The trip coil of a circuit breaker is connected through a CT of ratio 50:1. If the normal line current is 160 A and circuit breaker is to operate at 125% normal line current, the trip mechanism should be set to operate at trip current of
(a) 3.2A   (b)4A   (c)5A   (d)none of these

71. A 3 phase, fully controlled, converter is feeding power into a dc load at a constant current of 150A. The rms current through each thyristor of the converter is
(a)50A   (b) 100A   (c) $150\sqrt{2/3}$ (d) $150/\sqrt{3}$

72. When a line commutated converter operates in the inverter mode it
(a) draws both real and reactive power from the AC supply
(b) delivers both real and reactive power to the AC supply
(c) delivers real power to the AC supply
(d) draws reactive power from the AC supply

73. A single line to ground fault occurs on an unloaded generator in phase a. If $x_d=x_2=0.25$pu., $x_0=0.15$pu., reactance connected in the neutral , $x_n=0.05$pu. and the initial prefault voltage is 1.0pu., then the magnitude of the fault current will be
(a)3.75 pu   (b) 1.54 pu   (c) 1.43 pu   (d) 1.25pu

74. A motor is receiving 25% of the power that is capable of receiving from an infinite bus. If the load of the motor is doubled, the maximum value of δ during the swinging of the rotor around its new equilibrium position will be
(a) 40^0 (b) $>30^0$ (c) $<30^0$ (d) 25^0

75. If a diode is used to rectify a sine wave of $10V_{rms}$, the minimum break in voltage of diode should be
(a) 3.32 V   (b) $5\sqrt{2}$ V   (c) 10V   (d)$10\sqrt{2}$ V

* * *   WISH YOU GOODLUCK   * * *

PART – B
(EC & TC: ELECTRONICS AND COMMUNICATION ENGINEERING AND TELECOMMUNICATION ENGINEERING)
SECTION – I OF PART – B

<u>**Each question carries one mark**</u>   **20 x 1 = 20 Marks**

46. Response is the measure of
    a. Quickness of the system
    b. How fast the system tracks the change in the input
    c. Both a & b
    d. None of these

47. Which of the following is the hardware description language?
    a. C   b. Verilog   c. VHDL   d. Both b & d

48. Which of the following is true about Open Collector configuration?
    a. The emitter of the transistor is grounded
    b. The collector of the transistor is grounded
    c. The emitter of the transistor is open
    d. Both a & c

49. In embedded hardware design context, "layout' is
    a. A soft form of representation of the PCB
    b. Software 'Blueprint' representing the physical placement of components in a hardware
    c. Both a & b
    d. None of these

50. The file inclusion pre-processor directive is
    a. #define   b. #include   c. #ifdef   d. None of these

51. The memory management routine used for changing the size of allocated bytes in a dynamically allocated memory block is
    a. malloc()   b. realloc()   c. clloc()   d. free()

52. GPRS communication divides the ratio channel into _____ timeslots.
    a. 2   b. 3   c. 5   d. 8

53. The architecture which supports easier implementation of the pipelining is
    a. Harvard   b. Von Neumann   c. Both a & b   d. None of these

54. All the conditional branching instructions specify the destination address by
    a. Relative offset method   b. Absolute address method
    c. Either a or b   d. None of these

55. An n-channel JFET has Idss = 8mA and Vp = - 5 Volts. The minimum value of Vds for Pinch-off region and the drain current Ids, for Vgs = - 2 volts in the Pinch-off region, is
    a. 1. 88 mA   b. 2.88 mA   c. 2.33mA   d. 2.55 mA

56. A dual beam CRO has
  a. Two horizontal amplifiers
  b. Two trigger circuits
  c. Two vertical amplifiers
  d. All of these

57. In the operation of half-wave rectifier with a capacitor-input filter, the ripple factor can be lowered by _____ the value of the filter capacitor by _____ the load resistance.
  a. decreasing, decreasing
  b. decreasing, increasing
  c. increasing, decreasing
  d. increasing, increasing

58. Mouse that is used in any PC works on the principle of :
  a. Software
  b. Hardware
  c. Interrupt
  d. All of these

59. UNIX / Linux Operating Ssytem is based on _____ architecture.
  a. Monolithic
  b. Mulit-threaded
  c. Threaded
  d. None of these

60. A common – base stage is designed to amplify an RF signal received by a 50-ohms antenna. Determine the required bias current if the input impedeance of the amplifier must "match" the impedance of the antenna
  a. 0.62mA
  b. 0.52mA
  c. 0.70mA
  d. 0.55mA

61. A bipolar differential pair employs a tail current of 0.5mA and a collector resistance of 1 kΩ. What is the maximum allowable base voltage if the differential input is large enough to completely steer the tail current? Assume Vcc = 2.5V.
  a. Less than 2 V
  b. Equal to 3V
  c. More than 2.5V
  d. None of these

62. An inverter must exhibit a transistion region only 50 mV wide. If the supply voltage is 1.8V, the gain of the circuit in this region is.
  a. 30
  b. 40
  c. 36
  d. 3.6

63. A type of memory, which is a sector of bytes that is erasable many times in a flash at the same instance in a single cycle, is
  a. Boot Flash
  b. Flash
  c. EEPROM
  d. OTP

64. The SNR are _____ for the higher modulating-signal frequencies than for the _____ modulating-signal frequencies.
  a. Lower, higher
  b. Higher, lower
  c. Lower, lower
  d. Higher, higher

65. Which of the following forward broadcasts onto other connected networks?
  a. Routers
  b. Bridges
  c. NIC cards
  d. Repeaters

<u>**Each question carries two marks**</u>   **10 x 2 = 20 Marks**

66. A sine wave of RMS vlaue of 70.7 V is applied to the primary of a full-wave center tapped rectifier with a transformer ratio 1:2. Assuming diode drop of 0.7V, the maximum PIV rating of each diode will be
   a. 199.3 V   b. 190.3 V   c. 109.3 V   d. 99.3 V

67. The bypass capcitor across the emitter resistance:
   a. Increases the emitter current   b. Increases the output current
   c. Improves the stability factor   d. Improves the gain

68. In voltage divider bias, operating point is 3V, 2 mA. If Vcc = 9 V, Rc = 2.2 kΩ, the value of Re is
   a. 200 kΩ   b. 400 kΩ   c. 800 kΩ   d. 1600 kΩ

69. In a common gate amplifier, the transconductance gm = 600 us, Rg = 1 MΩ. The total input resistance will be :
   a. 1666 Ω   b. 166.6 Ω   c. 1 Ω   d. 10666.6 Ω

70. If the differential and common mode gains of a differential amplifer are 50 and 0.2 respectively, then the CMRR will be:
   a. 10   b. 49.8   c. 50.2   d. 250

71. An AND gate is a
   a. Sequential circuit   b. Combinational circuit
   c. Memory circuit   d. Relaxation Circuit.

72. The energy stored in a 1000uF capacitor at t = 50 microsec, if the voltage across it is $1.5\cos10^5t$ volts is
   a. 80.52 uJ   b. 90.52 uJ   c. 100.52 uJ   d. 99.52 uJ

73. The voltage across a 0.2H inductor is 100 V for 0 < t < = 10 ms; decreases linearly to zero in the interval 10 < t < 20 ms; is 0 for 20 < = t < 30 ms; is 100V for 30 < t < 40 ms; and is zero thereafter. Assume the passive sign conversion for vL and iL. Find iL at t= 8ms, if iL (0) = - 2A.
   a. 4 A   b. 3 A   c. 2 A   d. 5 A

74. A volatage waveform appearing across an unknown element is given as 7u(t) - 0.2u(t) + 8u (t – 2) + 3 V. If the corresponding current through that element is 3.5u(t) - 0.1 u(t) + 4u(t-2) + 1.5 A, what type of element is it, and what is its value?
   a. 2-ohms resistance   b. 2 H inductor   c. 2uF Capacitor   d. 5-ohms resistor

75. Four ideal independent voltage sources, A cos 10t, B sin (10t + 45°), C cos 40t and the constant D, are connected in series with a 4-ohms Resistor. Find the average power dissipated in the resistor if A = C = 10V, B = D = 0V.
   a. 20 W   b. 25 W   c. 50 W   d. 15 W

* * *   **WISH YOU GOODLUCK**   * * *

Each question carries one mark   **20 × 1 = 20 Marks**

46. The time required for cell to return to its pre-stimulus state is known as
    a. Stimulus threshold   b. Refractory period   c. Critical time   d. Excitation time

47. In which mode of ECG machine stilus moves in response to input signal but the paper is stationary?
    a. Standby mode   b. Pericardial mode   c. Augmented mode   d. Isolated mode

48. In Balke-Wave Protocol used in treadmill test, the constant speed used is
    a. 4.6 miles/hour   b. 6.8 miles/hour   c. 3.3 miles/hour   d. 1.2 miles/hour

49. The device which gives external stimulus to heart muscles to regulate heart beats is known as
    a. Defibrillator   b. Pacemaker   c. ECG machine   d. Electrosurgical unit

50. The coronary vessels of heart are examined using
    a. Angio cardiograph   b. Coronary angiography
    c. Cerebral angiography   d. Fluoroscopy

51. The unit of radioactivity is
    a. Peri   b. Rem   c. Curie   d. Rontegen

52. The Planck's equation is given by
    a. $E=hwo$ b. $E=\sqrt{Bo}$ c. $E=(hwo)^2$ d. $E=(\sqrt{Bo})^2$

53. Common scan used in echo cardiograph is
    a. Linear scan   b. Sector Scan   c. Compound Scan   d. None of these

54. A signal is periodic with period T if x(t) equals
    a. $x(-t)$ b. $x(1/t)$ c. $x(t+T)$ d. $x(T)$

55. Any periodic function can be expressed by a Fourier series when the function has
    a. Infinite number of finite discontinuities in a period
    b. Finite number of infinite discontinuities in a period
    c. Finite number of finite discontinuities in a period
    d. Infinite number of infinite discontinuities

56. In DIF – FFT diagram
    a. Input data appears in the bit reversed order
    b. The power r of W_N is a variable which depends on the position of butterfly in flow diagram
    c. Frequency domain values are in natural order
    d. All the above three

57. Bilinear transformation is defined by the substitution
    a. $S = 2/t \left[1- z^{-1} / 1 + z^{-1}\right]$ b. $S = 1 – z^{-1} / T$
    c. $S = ze^{sT}$ d. $S = e^T$

58. The duration of P wave represents conduction through
   a. SA Node   b. Ventricles   c. Bundles of HIS   d. Atria

59. An arrhythmia condition where a normal beat is followed by two premature beats and one full compensatory pause is
   a. Brady cardia   b. Tachycardia   c. Bigeminy   d. Trigeminy

60. Transducer used to acquire PCG signal is
   a. LVDT   b. LDR   c. Microphone   d. RTD

61. The Minimum number of leads simultaneously used in holter monitoring is
   a. 1   b. 2   c. 3   d. 4

62. One among the oldest sources of EM radiation used for imaging
   a. X-rays   b. Gamma rays   c. Radio waves   d. Microwaves

63. A body that reflects light and is relatively balanced in all visible wavelength appears to the observer
   a. Black   b. White   c. Colored   d. None of these

64. Smoothing spatial filters are used for
   a. Blurring   b. Noise Reduction   c. Both a and b   d. None of these

65. A spatial average filter in which all coefficients are equal is sometimes called
   a. Round   b. Square   c. Box   d. Rectangle

(BM & ML : BIOMEDICAL ENGINEERING & MEDICAL ELECTRONICS)
SECTION – II OF PART – B

Each question carries Two marks $10 \times 2 = 20$ Marks

66. The NMR imaging could cause potential health hazard due to
   a. Heating due to rf power   b. Static magnetic field
   c. Electric current induction   d. All of these

67. The N-term Bartlett window is defined by
   a. $w(n) = \{1, 0 \leq n \leq N-1, 0, \text{ else where}$ b. $w(n) = \{1-2|n-(N-1)/2 \,/\, N-1|, 0 \leq n \leq N-1$
   c. $w(n) = \{ 0.5-0.5 \cos(2\pi n \,/\, N-1)$ d. $w(n) = 0.54 – 0.46 \cos(2\pi n \,/\, N-1)$

68. The continuous time LTI system is causal if
   a. $h(t) = 0$, for $t=0$ b. $h(t) = 0$, for $t > 0$ c. $h(t) = 0$. for $t < 0$ d. $h(t) = 1$, for $t < 0$

69. Z transform of $x(n+n_o)$ is
   a. $Z^{-no} X(Z)$ b. $Z^{no} X(Z)$ c. $X(Z + Zo)$ d. $X(Zo)$

70. The audiometer used to obtain air conduction and bone conduction thresholds of hearing is
   a. Pure tone Audiometer   b. Speech Audiometer
   c. Bone vibrators   d. None of these

71. The standard clinical vector cardiogram uses __ leads
    a. 2   b. 3   c. 4   d. 12

72. A Speech signal is segmented into elementary patterns like word and phoneme using model called
    a. Parametric Model   b. Phenomenological model
    c. Markov Model   d. Prony's model

73. If the compression ratio of a given image is 1.11 then the level of redundancy will be
    a. 0.99   b. 0.099   c. 0.88   d. 0.088

74. The response of derivative operators in an area of constant gray level would be
    a. One   b. Two   c. Zero   d. None of these

75. Ultrasonic directional Doppler blood velocities detection may be achieved using
    a. Singe side bond   b. Heterodyne
    c. Phase quadrature detection   d. All of these

* * *   WISH YOU GOODLUCK   * * *

PART – B
(IT : INSTRUMENTATION TECHNOLOGY)
SECTION – I OF PART – B

Each question carries one mark   **20 × 1 = 20 Marks**

46. Seismic type of transducer has a damping constant of 10. The transducer is designed to measure

    a. Acceleration   b. Velocity   c. Displacement   d. Force

47. The most suitable metals for balls and rollers of antifriction bearings are

    a. Mild steel   b. Hardened low carbon steel
    c. Hardened high carbon steel   d. Hardened Chromium steel

48. An integral control is used to

    a. Improve the transient response   b. Reduce the offset
    c. Eliminate the offset   d. Reduce the settling time

49. The method widely accepted to determine oxides of nitrogen in an automobile emission is

    a. Orsat analysis   b. Gas-chromatography
    c. Chemi-luminiscence   d. Flame-ionization detection

50. The sensing element of a thermocouple at its hot junction is provided with a shield while taking measurements in a high temperature gas. The principal reason providing the shield is to

    a. reduce conduction and convection errors
    b. reduce radiation error
    c. provide temperature compensation to Seebeck effect
    d. improve air supply to sensing element for better response

51. A real function f(t) has a Fourier transform F(ω). The Fourier transform of [f(t)-f(-t)] is

    a. Zero   b. Real   c. Real and odd   d. Imaginary

52. A Pirani gauge sensor is used to measure pressure of the order of

    a. 10MPa   b. 1MPa   c. 100Pa   d. 1Pa

53. The loop transfer function of a system has a pole in right half of the s-plane. The Nyquist plot makes one clockwise encirclement of (-1, 0) point. The closed loop system is

    a. Unstable   b. Stable   c. Marginally stable   d. Asymptotically stable

54. The dominant poles of a sevosystem are located at $S = (-2\pm j2)$. The damping ratio of the system is

    a. 1   b. 0.8   c. 0.707   d. 0.6

55. A thermometer at room temperature 30° C is dipped suddenly into a bath of boiling water at 100° C It takes 30 seconds to reach 96.5° C. Time required to reach a temperature of 98° C is

    a. 32.5s   b. 34.6s   c. 35.6s   d. 38.6s

56. Which of the following sequences is NOT a power signal?

    a. Unit step sequence   b. $e^{j\alpha n}$
    c. A periodic sequence   d. Unit ramp sequence

57. The discrete LTI system with this impulse response is non-causal

    a. $a^n u(n-2)$ b. $a^{n-2} u(n)$ c. $a^{n+2} u(n)$ d. $a^n u(n+2)$

58. A pitot-static tube is used for measuring velocity of a gas, flowing in a duct. The velocity is proportional to

    a. Square root of the total pressure measured by the tube
    b. The total pressure measured by the tube
    c. Difference between total and static pressure
    d. Square root of difference between total and static pressure

59. Which of the following instruments uses an ultrasonic transducer?

    a. Echo-cardiograph   b. Electro-cardiograph
    c. Electro-encephalograph   d. None of these

60. Among the electrodes which are used to record ECG signals, the one used for ground referencing is placed at,

    a. Left arm   b. Right leg   c. Left leg   d. Right arm

61. Which of the following restrictors has the highest discharge co-efficient?

    a. Orifice plate   b. Flow nozzle   c. Venture tube   d. None of these

62. Linear variable differential transformer has

    a. Two primary coils connected in phase and a secondary coil
    b. Two primary coils connected in opposition and a secondary coil
    c. Two primary coils and two secondary coils connected in phase
    d. Two primary coils and two secondary coils connected in opposition

63. The measurements of a source voltage are 5.9V, 5.7V and 6.1V. The sample standard deviation of the readings is equal to

    a. 0.013   b. 0.04   c. 0.115   d. 0.2

64. Stop band attenuation of Hamming window will be,

    a. 53 dB   b. 25 dB   c. 74 dB   d. 44 dB

65. A Butterworth filter has

    a. Very smooth transition band   b. Very smooth stop band
    c. Very smooth pass band   d. None of these

(IT : INSTRUMENTATION TECHNOLOGY)
SECTION – II OF PART – B

Each question carries Two marks   **10 × 2 = 20 Marks**

66. A PID controller has the transfer function $2 + \dfrac{0.4}{s}$ with the unit of time expressed in minutes. The parameters proportional band and reset time for the above controller are respectively

    a. 200% and 0.4 min   b. 50% and 0.4 min   c. 200% and 5 min   d. 50% and 5 min

67. A $3\frac{1}{2}$ digit multi-meter has an accuracy specification of 0.5% of reading plus 5 counts. The value of an unknown resistance is read as 50Ω on the 200Ω scale of the meter. The value of resistance is
    a. 50±0.25 Ω   b. 50±0.5 Ω   c. 50±0.75 Ω   d. 50±1.0 Ω

68. Two narrow straight slits, 0.25 mm apart are illuminated by an unknown monochromatic source of light. If fifth bright fringe is 12 mm away from central fringe when the screen distance is 0.8 m, the wavelength of the unknown source is,
    a. 540 nm   b. 600 nm   c. 700 nm   d. 750 nm

69. A pressure sensor has the fallowing specifications
Sensitivity at the design temperature = 10V/MPa, zero drift = 0.01V/deg cel,
Sensitivity drift = 0.01 (V/MPa)/deg cel
When the sensor is used in an ambient 20° C above the design temperature, the output from the device is 7.4 V. The true value of the pressure will be
    a. 0.71 MPa   b. 0. 68 MPa   c. 0.65 MPa   d. 0. 61 MPa

70. A strain gauge of resistance 120Ω and gauge factor 2.0 is at zero strain condition. A 200k Ω fixed resistance is connected in parallel with it. The combination will represent an equivalent strain of
    a. 5290 µm/m   b. Zero   c. -123.8 µm/m   d. -300 µm/m.

71. A single sensor, contact-type ultrasonic flaw detector uses a frequency of 330 kHz. When testing a specimen, an echo from a flaw is recorded 0.05 mass after the transmitted pulse. If the velocity of sound in the test object is 0.6 km/s then the flaw is at a depth of
    a. 120 cm
    b. 60 cm
    c. 30 cm
    d. 15 cm

72. A certain closed loop system with unity feedback has a forward path transfer function given by $G(s) = \dfrac{K}{s(s+1)(s+5)}$. With the gain set at the ultimate value, the system will oscillate at an angular frequency of
    a. $\sqrt{6}$ rad/s
    b. $\sqrt{5}$ rad/s
    c. $\sqrt{2}$ rad/s
    d. $\sqrt{3}$ rad/s

73. The fundamental period of the sequence $x[n] = 3\sin(1.3\pi n + 0.5\pi) + 5\sin(1.2\pi n)$ is
    a. 20
    b. $\dfrac{2\pi}{1.3\pi}$
    c. $\dfrac{2\pi}{1.2\pi}$
    d. 10

74. The output from a 633 nm He-Ne laser comes out from the mirror with a beam diameter of 1 mm and diverges to the far field. It is brought to a focus by convex lens of focal length of 17 mm. the spot size diameter of the beam at the focal point is
    a. 20 μm
    b. 26 μm
    c. 52 μm
    d. 13 μm

75. A thermocouple is made using a copper and iron wire. Its measuring junction is kept at a temperature of 100° C and the reference junction is kept at the ambient temperature of 30° C. The emf developed would be
    a. 700 μV
    b. 1000 μV
    c. 3010 μV
    d. 5300 μV

*** WISH YOU GOODLUCK ***