THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA, VADODARA
Ph. D. ENTRANCE TEST (PET) 2025

Signature of Invigilator

Roll. No.

Paper - II
Electrical Engineering

Maximum Marks: 50　　　　　　　　　　　　　　　　　　**No. Of Printed Pages: 8**

Instruction for the Candidate:

1. This paper consists of **FIFTY (50)** multiple choice type questions. Each Question carries **ONE (1)** mark.
2. There is no Negative Marking for Wrong Answer.
3. A separate OMR Answer Sheet has been provided to answer questions. Your answers will be evaluated based on your response in the OMR Sheet only. No credit will be given for any answering made in question booklet.
4. Defective question booklet or OMR if noticed may immediately replace by the concerned invigilator.
5. Write roll number, subject code, booklet type, category and other information correctly in the OMR Sheet else your OMR Sheet will not be evaluated by machine.
6. Select most appropriate answer to the question and darken appropriate oval on the OMR answer sheet, with black / blue ball pen only. DO NOT USE PENCIL for darkening. In case of over writing on any answer, the same will be treated as invalid. Each question has exactly one correct answer and has four alternative responses (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.
   Example: (A) ● (C) (D)　where (B) is correct response.
7. Rough Work is to be done in the end of this booklet.
8. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Answer Sheet, except for the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, such as change of response by scratching or using white fluid, you will render yourself liable to disqualification.
9. Calculators, Log tables any other calculating devices, mobiles, slide rule, text manuals etc are NOT allowed in the examination hall. If any of above is seized from the candidates during examination time; he/ she will be immediately debarred from the examination and corresponding disciplinary action will be initiated by the Center Supervisor as deemed fit.
10. DO NOT FOLD or TEAR OMR Answer sheet as machine will not be able to recognize torn or folded OMR Answer sheet.
11. **You have to return the OMR Answer Sheet to the invigilator at the end of the examination compulsorily** and must not carry it with you outside the Examination Hall. You are however, allowed to carry original question booklet on conclusion of examination.

Note: This paper contains **FIFTY (50)** multiple-choice questions. Each Question carries **ONE (1)** mark.

01) The Boolean function f implemented in the figure using two input multiplexers is
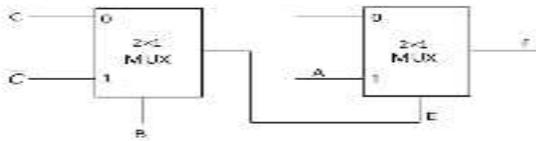
A) AB'C + ABC'
B) ABC + AB'C'
C) A'BC + A'B'C'
D) (AB)'C + A'BC'

02) Without any additional circuitry, an 8:1 MUX can be used to obtain
A) some but not all Boolean function of 3 variables
B) All function of 3 variable but none of 4 variables
C) All functions of 3 variables and some but not all 4 variables
D) All functions of 4 variables

03) In the latch circuit shown, the NAND gates have non-zero, but unequal propagation delays. The present input condition is: P = Q = "0". If the input condition is changed simultaneously to P = Q = "1", the outputs X and Y are
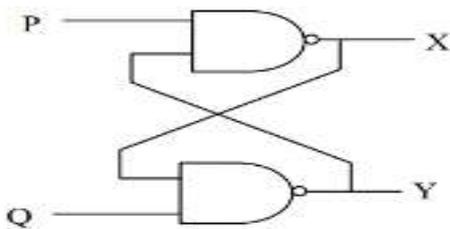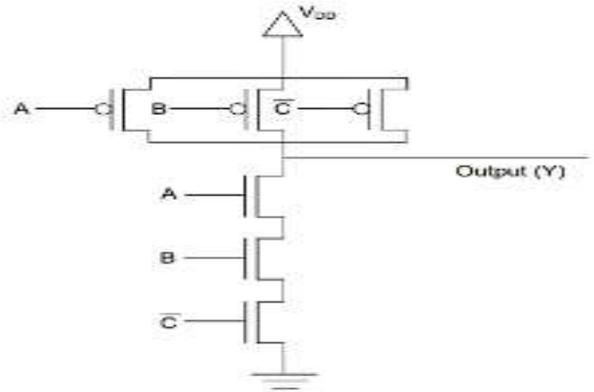

A) X =1 , Y = 1
B) Either X = 0, Y = 1 or X = 1 ,Y = 0
C) Either X = 1, Y = 1 or X = Y = 0
D) X = 0, Y = 0

04) The output of the combinational circuit given below is

A) A+B+C
B) A(B+C)
C) B(A+$\overline{A}$C)
D) C(A+B)

05) The output (Y) of the circuit shown in the figure is

A) A' + B' + C
B) A + B'C' + A C'
C) A' + B + C'
D) A B C'

06) The higher and lower bytes of a 16-bit register DPTR in 8051 are represented respectively as
A) LDPTR and HDPTR
B) DPTRL and DPTRH
C) DPH and DPL
D) HDP and LDP

07) If a periodic function f(t) of period T satisfies f(t) = -f(t + T/2), then in its Fourier series expansion,
A) the constant term will be zero
B) there will be no cosine terms
C) there will be no sine terms
D) there will be no even harmonics

08) The Fourier transform of $e^{-a|t|}$ is
A) $\frac{1}{a^2+\omega^2}$
B) $\frac{2a}{a^2-\omega^2}$
C) $\frac{2\omega}{a^2+\omega^2}$
D) $\frac{2a}{a^2+\omega^2}$

09) What is the z-transform of the following finite duration signal?

$$x(n)=\{2,4,5,7,0,1\}?$$
$$\uparrow$$

A) $2 + 4z + 5z^2 + 7z^3 + z^4$
B) $2 + 4z + 5z^2 + 7z^3 + z^5$
C) $2 + 4z^{-1} + 5z^{-2} + 7z^{-3} + z^{-5}$
D) $2z^2 + 4z + 5 + 7z^{-1} + z^{-3}$

[P.T.O]

10) What is the set of all values of z for which X(z) attains a finite value?
   A) Region of convergence
   B) Region of divergence
   C) Feasible solution
   D) None of the mentioned

11) The convolution *u(t) * u(t)* is
   A) $u^2(t)$
   B) *tu(t)*
   C) $t^2u(t)$ $t^2u(t)$
   D) *u(t) + u(t)*

12) An acoustic panel reduces the intensity of a sound from 60 microwatt/m^2 to 8.0 microwatt/m^2. Express the attenuation in dB.
   A) 8.75 dB
   B) -17.6 dB
   C) -1.249 dB
   D) -8.75 dB

13) A system in z-domain is represented as follows $X(z) = Y(z) - z^{-1}Y(z)$. What form will it take in time domain?
   A) x[n] = y[n] - y[n-1].
   B) n.x[n] = y[n] - y[n-1].
   C) x[n] = y[n] - (n-1)y[n].
   D) n.x[n] = ny[n] - y[n-1]

14) If the reference bus is changed in two load flow runs with same system data and power obtained for reference bus taken as specified P and Q in the latter run
   A) The system losses will be unchanged but complex bus voltages will change
   B) The system losses will change but complex bus voltages will remain unchanged
   C) The system losses as well as complex bus voltages will change
   D) The system losses as well as complex bus voltages will remain unchanged

15) AC Voltage Controller converts
   A) Fixed AC to Variable AC with variable frequency
   B) AC to DC
   C) DC to AC
   D) AC to variable AC with same frequency

16) The single phase center tapped type cycloconverter uses _____ number of SCRs.
   A) 4
   B) 8
   C) 6
   D) 12

17) Effect of Free wheeling Diode is
   A) Improvement of power factor
   B) It discontinue load current
   C) Poor power factor
   D) No effect of performance

18) Supply power factor in single phase semi converter for firing angle A is
   A) Cos A
   B) Cos(A/2)
   C) 1
   D) Cos(A/4)

19) Wiener Filter provides optimum detection in
   A) Minimum of mean square of error sense
   B) Least Square of error sense
   C) Sum of error square sense
   D) Root mean Square of error sense

20) An SCR is a
   A) four layer, four junction device
   B) four layer, three junction device
   C) four layer, two junction device
   D) three layer, single junction device

21) In a resistance firing circuit the firing angle
   A) cannot be greater than 120°
   B) cannot be greater than 90°
   C) cannot be greater than 180°
   D) cannot be greater than 160°

22) A 50-kva 550-volt single-phase alternator has an open- circuit emf of 300 volts when the field current is 14 amp. When the alternator is short-circuited through an ammeter, the armature current is 160 amp, the field current still being 14 amp. The ohmic resistance of the armature between terminals is 0.16 ohm. The ratio of effective to ohmic resistance may be taken as 1.2. Determine regulation at 0.8 power factor, current lagging.
   A) 23.10%
   B) 32.10%
   C) 13.10%
   D) 8%

23) What is the purpose of differential amplifier stage in internal circuit of Op-amp?
   A) Low gain to differential mode signal
   B) Cancel difference mode signal
   C) Low gain to common mode signal
   D) Cancel common mode signal

24) Noise values in milliwatts are measured at various times, as given below: 10, -100, 35, -57, 90, 26, 26, -10, -15, -20
   What will be the RMS value of noise?
   A) 24751 mV
   B) 2475.1 mV
   C) 49.75 mV
   D) 497.5 mV

25) What is the phase-shift between input and output voltages of CE amplifier?
   A) 90°
   B) 120°
   C) 180°
   D) 270°

26) For a fixed bias circuit having R_C=4.7KΩ and R_B=1KΩ, V_{CC}=10V, and base current at Bias point was found to be 0.2µA, Find β?
   A) 100
   B) 106
   C) 125
   D) 0

27) In a bridge full wave rectifier, the input sine wave is 40sin100t. The average output voltage is_____
   A) 22.73V
   B) 16.93V
   C) 25.47V
   D) 33.23V

28) The impulse response of a system is given as:
   $h[n] = \frac{\sin w_c n}{\pi n}$
   A) This system is an ideal low pass filter in discrete time
   B) This system is an ideal high pass filter in discrete time
   C) This system is an ideal band pass filter in discrete time
   D) This system is an ideal band pass filter in continuous time

29) A generator is protected by restricted earth fault protection. The generator ratings are 13.2 KV, 10 MVA. The percentage of winding protected against phase to ground fault is 85 %. The relay setting is such that it trips for 20% out of balance. The resistance to be added in the neutral to ground connection is ....
   A) 19.68 ohm
   B) 13.068 ohm
   C) 21.48 ohm
   D) 786 ohm

30) A system is given as:

   $(z) = (1 - 0.3z^{-1} + 0.9z^{-2})(1 - 0.5z^{-1})$

   This is a representation of

   A) FIR filter in frequency domain
   B) IIR filter in time domain
   C) FIR filter in time domain
   D) IIR filter in frequency domain

31) For a unit step input a system with forward path transfer function G(s)=20/s^2 and feedback path transfer function H(s)=(s+5) has a steady state output of
   A) infinite
   B) 5
   C) 2
   D) Zero

32) If a system is subjected to step input, which type of static error coefficient performs the function of controlling steady state error?
   A) Position
   B) Velocity
   C) Acceleration
   D) Retardation

33) Time taken by the response to reach and stay within a specified error is called
   A) Rise Time
   B) Peak Time
   C) Settling Time
   D) Peak Overshoot

34) Consider the following statements:
1. A system is said to be stable if its output is bounded for any input
2. A system is stable if all the roots of the characteristics equation lie in the left half of the s-plane
3. A system is stable if all the roots of the characteristics equation have negative real parts
4. A second order system is always stable for finite positive values of open loop gain.
   Which of the above statements is/are wrong?
   A) 2,3 and 4
   B) 1 only
   C) 3 only
   D) 3 and 4 only

35) The magnitude-frequency response of a control system is shown in the figure. The value of ω_1 and ω_2 are respectively
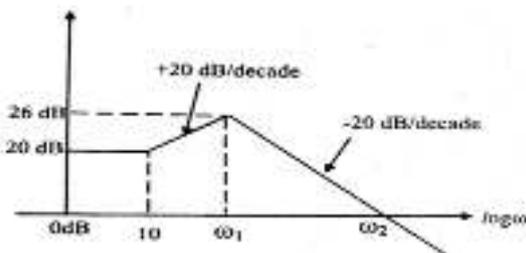
A) 10 and 200
B) 20 and 200
C) 20 and 400
D) 100 and 4000

36) The transfer function of a system is $\frac{2s^2+6s+5}{(s+1)^2(s+2)}$
The characteristic equation of this system can be depicted as:
A) $2s^2+6s+5=0$
B) $(s+1)^2(s+2)=0$
C) $2s^2+6s+5+(s+1)^2(s+2)=0$
D) $2s^2+6s+5-(s+1)^2(s+2)=0$

37) In polar plots, if a pole is added at the origin, what would be the value of the magnitude at $\Omega = 0$?
A) Zero
B) Infinity
C) Unity
D) Unpredictable

38) A resistance of approximate value of 80 ohm is to be measured by voltmeter-ammeter method using a 1 A ammeter having a resistance of 2 ohm and a 50 V voltmeter having a resistance of 5000 ohm. Identify the correct method which gives less error and if in the suggested method the following measurements are made : I = 0.42 A and V = 35.5 V. ……………will be the resulting error in the ammeter reading if the accuracy of the instruments is ± 0.5 % at full scale and the errors are standard deviations.
A) 9.19%
B) 1.19%
C) 0%
D) 7.81%

39) If a resistor R_x is connected between nodes X and Y, R_y between X and Z, R_z between Y and Z to form a delta connection, then after transformation to star, the resistance at node Z is?
A) $R_yR_x/(R_x+R_y+R_z)$
B) $R_yR_x/(R_x+R_y+R_z)$
C) $R_zR_y/(R_x+R_y+R_z)$
D) $(R_z+R_x)/(R_x+R_y+R_z)$

40) Find the voltage at node P in the following figure
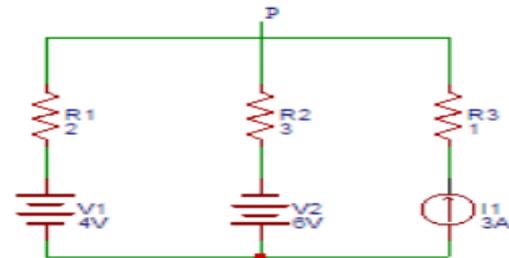
A) 8V
B) 9V
C) 10V
D) 11V

41) According to Millman's Theorem, if there are n voltage sources with n internal resistances respectively, are in parallel, then the value of equivalent voltage source is?
A) $V'=(V_1G_1+V_2G_2+\cdots+V_nG_n)$
B) $V'=((V_1G_1+V_2G_2+\cdots+V_nG_n))/((1/G_1+1/G_2+\cdots1/G_n))$
C) $V'=((V_1G_1+V_2G_2+\cdots+V_nG_n))/(G_1+G_2+\cdots G_n)$
D) $V'=((V_1/G_1+V_2/G_2+\cdots+V_n/G_n))/(G_1+G_2+\cdots G_n)$

42) In the circuit given below, the value of the hybrid parameter h_{11} is _____

A) 10 Ω
B) 7.5 Ω
C) 5 Ω
D) 2.5 Ω

43) A 50Ω resistor is connected in parallel with an inductive reactance of 30Ω. A 20V signal is applied to the circuit. Find the line current in the circuit.
A) 0.77∠-58.8⁰
B) 0.77∠58.8⁰
C) 0.88∠-58.8⁰
D) 0.88∠58.8⁰

44) Impulse response of a system is given as h(n)= (a)^n .u(n). For the system to remain stable following condition should be fulfilled
A) ∞< a <1
B) -1< a <∞
C) -∞< a <∞
D) -1< a <1

45) Music CDs employ uniform quantization. The sampling frequency is 44,100 samples/sec. Each sample is then quantized using 16 bits. Calculate the encoding rate of music on CDs
A) 88200bps
B) 705600bps
C) 325800bps
D) 44100bps

46) A system is described as:
$$X(z) = Gz^{N-M}\frac{\prod_{k=1}^{M}(z-z_k)}{\prod_{k=1}^{N}(z-p_k)}$$
This system has
A) M number of zeros and N number of poles
B) N number of zeros and N-M number of poles
C) N-M number of zeros and M number of poles
D) N number of zeros and M number of poles

47) If no two branches of the graph cross each other, then the graph is called?
A) directed graph
B) undirected graph
C) planar graph
D) non-planar graph

48) Tie-set is also called?
(A) f loop
(B) g loop
(C) d loop
(D) e loop

49) A 3-phase , 200 KVA, 11 KV/400V transformer is connected in delta-star . The CTs on LV side have turns ratio of 500/5. Proposed scheme of protection will be …….. and the circulating current through relay will be ……. when the fault of 750 A of earth fault within the protective zone occur on the LV side.
A) differential relaying, 32.99 A
B) overcurrent relaying, 21.99 A
C) differential protection, 12.99 A
D) differential protection, 21.99 A

50) The addressing mode, in which the instructions has no source and destination operands is
A) register instructions
B) Implied addressing mode
C) Direct Addressing Mode
D) Immediate addressing mode

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Rough Work: