# THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA, VADODARA

## Ph. D. ENTRANCE TEST (PET) – 27th January 2019

**Signature of Invigilators**

**Roll. No.**

(in figures as in Hall Ticket)

**Electrical Engineering
(19/37)**

**Roll No.** _____

_____

_____

**(in words)**

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

**Instruction for the Candidate:**

1. Write your Roll Number in the space provided on the top of this page.
2. This paper consists of **FIFTY (50)** multiple choice type questions. Each Question carries **ONE (1)** mark.
3. At the commencement of examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as below:
   a. To have access to the Question Booklet, tear off the paper seal on the edge of this cover page, Do not accept a booklet without sticker seal and do not accept an open booklet.
   b. Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faculty booklets due to pages/questions missing or duplicate or not in serial order or any other discrepancy should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.
   c. After this verification is over, the Test Booklet Number should be entered on the OMR Answer Sheet and the OMR Answer Sheet Number should be entered on this Test Booklet.
4. Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.
   **Example:** Ⓐ ⬤ Ⓒ Ⓓ  where (B) is correct response.
5. Your responses to the items are to be indicated on the OMR Answer Sheet under Paper – II only. If you mark your response at any place other than in the circle in the OMR Answer Sheet, it will not be evaluated.
6. Read instructions given inside carefully.
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. You have to return the original 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 and duplicate copy of OMR Answer Sheet on conclusion of examination
10. Use only Blue/ Black Ball point pen.
11. Use of any calculator or log table etc., is prohibited.
12. There shall be no negative marking.

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

01) The directional derivative of the following function at (1,2) in the direction of (4i+3j) is
    $$F(x, y) = x^2 + y^2$$
    A) 4/5
    B) 4
    C) 2/5
    D) 1

02) The series $x \log x + x^2 \log 2x + \ldots + x^n \log nx + \ldots$ is convergent if
    A) $x \geq 1$
    B) $x < 1$
    C) $x \leq 1$
    D) none of these

03) The function $F(x, y) = x^5 - 5x^4 + 5x^3 - 1$ has
    A) one minima and two maxima
    B) two minima and one maxima
    C) two minima and two maxima
    D) one minima and one maxima

04) If there exists a non-zero minor of order r, then rank of A is
    A) equal to r
    B) greater than or equal to r
    C) less than or equal to r
    D) less than r

05) Solutions to the equations
    $$2x+3y=1$$
    $$x-y=4$$
    $$4x-y=a$$
    will exist if a is equal to

    A) -33
    B) 0
    C) 9
    D) 12

06) The open-loop function of a unity-gain feedback control system is $K/(s+1)(s+2)$. The gain margin of the system in dB is given by
    A) 0
    B) 1
    C) 20
    D) infinite

07) The transfer function of a phase lead compensator is $(1+3T_s)/(1+T_s)$ where $T_s > 0$. The maximum phase shift provide by such a compensator is
    A) $\pi/2$
    B) $\pi/3$
    C) $\pi/4$
    D) $\pi/6$

08) Despite the presence of negative feedback, control systems still have problems of instability because the
    A) Components used have non-linarites
    B) Dynamic equations of the subsystem are not known exactly
    C) Mathematical analysis involves approximations.
    D) System has large negative phase angle at high frequencies

09) A causal system having the transfer function $1/(s+2)$ is excited with $10\ u(t)$. The time at which the output reaches 99% of its steady state value is
    A) 2.7 sec
    B) 2.5 sec
    C) 2.3 sec
    D) 2.1 sec

10) A control system has a plant $100/s(s+100)$ in cascade with a PD controller. For a velocity error constant of 1000 and the damping ratio 0.5 controller parameters are:
    A) $KP = 100, KD = 0.09$
    B) $KP = 100, KD = 0.9$
    C) $KP = 10, KD = 0.09$
    D) $KP = 10, KD = 0.9$

11) An amplifier with resistive negative feedback has two left half plane poles in its open-loop transfer function. The amplifier
    A) will always be unstable at high frequency
    B) will be stable for all frequency
    C) may be unstable, depending on the feedback factor
    D) will oscillate at low frequency

12) The transfer functions of two compensators are given below:
$C_1 = 10(s+1)/(s+10)$ and $C_2 = (s+10)/10(s+1)$
Which one of the following statements is correct?
A) C1 is lead compensator and C2 is a lag compensator
B) C1 is a lag compensator and C2 is a lead compensator
C) Both C1 and C2 are lead compensators
D) (D) Both C1 and C2 are lag compensators

13) International ohm is defined in term of the resistance of
A) a cube of carbon
B) a cube of copper
C) a column of mercury
D) the unit length of metal wire

14) Iron losses in a D.C. machine are independent of variations in
A) speed
B) load
C) voltage
D) speed and voltage

15) The direction of rotation of a D.C. series motor can be changed by
A) interchanging supply terminals
B) interchanging field terminals
C) either of and above
D) None of the above

16) The speed of a D.C. shunt motor can be increased by
A) increasing the resistance in armature circuit
B) increasing the resistance in field circuit
C) reducing the resistance in the field circuit
D) reducing the resistance in the armature circuit

17) Which of the following characteristics is recommended for materials subjected to rapid reversal of magnetism?
A) Large area of BH loop
B) High permeability and low hysteresis loss
C) High coercivity and low density
D) High coercivity and high retentivity

18) An ideal synchronous motor has no starting tor because the
A) rotor is made-up of salient poles
B) relative velocity between the starter and the rotor mmf's is zero
C) relative velocity between stator and rotor mmf's is not zero
D) rotor winding is highly reactive

19) Crawling' in an induction motor is due to
A) time harmonics in supply
B) slip ring rotor
C) space harmonics produced by winding currents
D) insufficient starting torque

20) A transformer can have regulation closer to zero
A) on full-load
B) on overload
C) on leading power factor
D) on zero power factor

21) In an induction motor ,if air gap is increased then
A) speed will reduce
B) efficiency will improve
C) power factor will be lowered
D) break down torque will reduce

22) Which one of the following statements is not correct for the use of bundled conductors in transmission lines?
A) control of voltage gradient
B) reduction in corona loss
C) reduction in radio interference
D) increase in interference with communication lines

23) The X:R Ratio of 220 kV line as compared to 400 kV line is
A) greater
B) smaller
C) equal
D) it could be anything

24) Whenever the conductors are dead-ended and there is a change in the direction of transmission line, the insulators used are of the
A) pin type
B) suspension type
C) strain type
D) shackle type

25) The unit protection scheme provides
A) primary protection
B) backup protection
C) simultaneous protection
D) remote protection

26) The operation of the relay which is most affected due to arc resistance is
A) mho relay
B) reactance relay
C) impedance relay
D) all are equally affected

27) The conductors, which connect the consumer's terminals to the distribution
A) Distributors
B) Service mains
C) Feeders
D) None of the above

28) A thyrite type lightning arrestor
A) blocks surge voltage appearing in a line
B) absorbs surge voltage appearing in a line
C) offers a low resistance path to the surge appearing in the line
D) returns surge back to the source

29) Which of the following are the constants of the transmission lines ?
A) Resistance
B) Inductance
C) Capacitance
D) All of the above

30) The transmission line distance protection relay having the property of being inherently directional is
A) impedance relay
B) MHO relay
C) OHM relay
D) reactance relay

31) Total instantaneous power supplied by a 3-phase ac supply to a balanced R-L load is
A) zero
B) constant
C) pulsating with zero average
D) pulsating with the non-zero average

32) The rated voltage of a 3-phase power system is given as
A) rms phase voltage
B) peak phase voltage
C) rms line to line voltage
D) peak line to line voltage

33) A 741-type opamp has a gain-bandwidth product of 1 MHz ,A non-inverting amplifier using this opamp and having a voltage gain of 20 dB will exhibit a 3-dB bandwidth of
A) 50 kHz
B) 100 kHz
C) 1000/17 kHz
D) 1000/7.07 kHz

34) MOSFET can be used as
A) Current-controlled Capacitor
B) Voltage-controlled Capacitor
C) Current-controlled Inductor
D) Voltage-controlled Inductor

35) Of the various commonly used logic families ,the one with highest speed and the one with least power dissipation, respectively ,are
A) TTL and CMOS
B) CMOS and TTL
C) CMOS and ECL
D) ECL and CMOS

36) Circuit turn-off time of an SCR is defined as the time
A) Taken by the SCR to turn off
B) Required for SCR current to become zero
C) For which the SCR is reverse biased by the commutation circuit
D) For which the SCR is reverse biased to reduce its current below the holding current

37) The V-I characteristics for a triac in the first and third quadrants are essentially identical to those of _____ in its first quadrant
   A) Transistor
   B) SCR
   C) UJT
   D) Diac

38) A source of angular frequency 1 rad/s has a source impedance consisting of 1 Ω resistance in series with 1 H inductance .The load that will obtain the maximum transfer is
   A) 1 Ω resistance
   B) 1 Ω resistance in parallel with 1 H inductance
   C) 1 Ω resistance in series with 1 F Capacitor
   D) 1Ω resistance in parallel with 1 F capacitor

39) The transist time pf the current carriers through the channel of a JFET decides its _____ characteristics
   A) Source
   B) Drain
   C) Gate
   D) Source and drain

40) The Darlington pair in Amplifier circuit creates
   A) High input impedance
   B) High current gain
   C) High voltage gain
   D) High output impedance

41) A Miller effect in the context of a Common Emitter amplifier explains
   A) an increase in the low-frequency cut-off frequency
   B) an increase in the high-frequency cut-off frequency
   C) a decrease in the low-frequency cut-off frequency
   D) a decrease in the high-frequency cut-off frequency

42) The minimum number of NOR gates is required to implement A'B'+AB
   A) 3
   B) 4
   C) 5
   D) 6

43) A full-adder can be implemented with half-adders and OR gates. A 4 bit parallel full adder without any initial carry requires
   A) 7 half-adders, 3 –OR gates
   B) 8 half-adders, 3 –OR gates
   C) 7 half-adders, 4 –OR gates
   D) 8 half-adders, 3 –OR gates

44) Nyquist's sampling theorem is applicable to only
   A) Power limited signals
   B) Energy limited signals
   C) Band limited signals
   D) All type of signals

45) When HLT instruction of 8085 micro-processor is executed, the microprocessor
   A) Reloads the program from the location 0024H and 0025 H
   B) Enters into a halt state and buses are tri stated
   C) Is disconnected from the system bus till the reset is pressed
   D) Halts execution of the program and returns to monitor

46) Choose the best one for DC and low frequency signal Amplification
   A) RC coupling Amplifier
   B) Transformer coupling Amplifier
   C) Direct Coupled Amplifier
   D) None of these

47) Lock out flip flops consist of
   A) S-R flip flop
   B) J-K flip flop
   C) D flip flop
   D) T flip flop

48) A types of memory device in which data is stored in this form of charge on a capacitor is
   A) Asynchronous RAM
   B) Synchronous RAM
   C) DRAM
   D) All of these

49) In a microprocessor, the service routine for a certain interrupt starts from a fixed location of memory which cannot be externally set, but the interrupt can be delayed or rejected. Such an interrupt is
   A) Non-maskable and non-vectored
   B) maskable and non-vectored
   C) Non-maskable and vectored
   D) maskable and vectored

50) How many hardware interrupts are in 8085?
   A) 3
   B) 4
   C) 5
   D) 1


******************************

**Rough Work:**