

GU-RET 2016

GAUHATI UNIVERSITY RESEARCH ELIGIBILITY TEST

INSTRUMENTATION

Booklet Series : **A**

Invigilator's Name and Signature

BOOKLET NO.

OMR SHEET NO.

ROLL NO.

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TIME : 2 HOURS 20 MINUTES

TOTAL MARKS : 80

Number of Pages in this Booklet : 18

Instructions for Candidates

1. Write your Roll No. and OMR Sheet No. in the boxes provided above.
2. This paper consists of two sections : **Section B** with 50 (fifty) multiple choice questions (MCQ) and **Section C** with 6 (six) descriptive questions. Each MCQ has 4 (four) answers, out of which **ONLY** one is correct. You have to darken the circle (on the OMR Sheet) for the correct answer corresponding to the question given in this booklet.

Example : (A) (B) (C) (D)

where (C) is the correct answer. No marks will be given for markings made in this booklet. The descriptive questions in **Section C**, **MUST** be answered in the space provided in this booklet. **No extra pages will be provided in any case.**

3. Use a BLACK ball point pen in your OMR Sheet.
4. Read the instructions given inside this booklet before attempting to answer any questions.
5. **DO NOT** write your name, roll no, phone no, or anything, or put any marks anywhere in this booklet, otherwise your candidature will be disqualified.
6. If you are found to resort to any kind of unfair means such as carrying extra material other than pen, pencil, watch, eraser, and scale, or copying from somebody or from external material, your candidature will be disqualified.
7. Use of mobile phones, programmable calculators, log tables or any other tables, wearable smart devices such as smart Android watches or objects of similar nature **CAN NOT** be used inside the examination hall.
8. At the end of the examination, you have to return this booklet and the OMR Sheet back to the invigilator.
9. There is no negative marks for incorrect answer.

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Section B (50 Marks)

1. The input amplifier in Op-amp is a
 - (A) Differential Input and Differential Output
 - (B) Differential Input and Single Ended Output
 - (C) Single Ended Input and Differential Output
 - (D) Single Ended Input and Single Ended Output

2. Principle of LVDT
 - (A) Change of current due to the position of the movable core
 - (B) Change of effective permeability due to the movable core
 - (C) Change of self inductance due to the movable core
 - (D) Change of voltage due to the position of the movable core

3. Which one of the following is NOT an 8085 hardware interrupt
 - (A) RST 6.5
 - (B) RST 7.5
 - (C) RST 7
 - (D) TRAP

4. Which of the following is NOT an 8085 flag?
 - (A) Carry
 - (B) Overflow
 - (C) Sign
 - (D) Parity

5. If the register $A = 55h$ with carry flag reset, what is the value of A and carry flag after execution of RAR
 - (A) Reg. $A = 2Ah$, $Cy = 1(\text{set})$
 - (B) Reg. $A = 55h$, $Cy = 0(\text{set})$
 - (C) Reg. $A = AAh$, $Cy = 0(\text{set})$
 - (D) Reg. $A = AAh$, $Cy = 1(\text{set})$

6. After executing the instruction XRA A. The status of the zero flag will be
 - (A) Set
 - (B) Reset
 - (C) No change
 - (D) None of above

7. A PD controller
 - (A) increases Damping factor
 - (B) increases maximum overshoot
 - (C) decreases damping
 - (D) both (A) and (B)

8. Characteristic equation of a control system is $0.24s^3 + s^2 + s + 4.167 = 0$. The system is
 - (A) Stable
 - (B) Unstable
 - (C) Marginally stable
 - (D) Conditionally stable

9. Magnitude part of the Bode plot of the function $1/s^2$ is a
 - (A) a straight line parallel to frequency axis
 - (B) a straight line with a slope -20 dB/decade
 - (C) a parabola
 - (D) a straight line with a slope of -40 dB/decade

10. The time base of a CRO is controlled by
 - (A) Square waveform
 - (B) Sine waveform
 - (C) Saw tooth waveform
 - (D) Staircase waveform

11. Principle of Strain gauges
 - (A) Change of resistance with length of the gauge wire
 - (B) Change of resistance with diameter of the gauge wire
 - (C) Change of resistance with temperature of the gauge wire
 - (D) Both (A) and (B)

12. Using Newton-Raphson method, find a root correct to three decimal places of the equation $\sin x = 1 - x$
- (A) 0.511
 (B) 0.500
 (C) 0.555
 (D) None of these
13. In which of the following methods proper choice of initial value is very important?
- (A) Bisection method
 (B) False position
 (C) Newton-Raphson
 (D) Bairsto method
14. In open loop system
- (A) the control action depends on the size of the systems
 (B) the control action depends on system variables
 (C) the control action depends on the input signal
 (D) the control action is independent of the output
15. Which of the following is the definition of proportional band of a controller?
- (A) The range of air output as measured variable varies from maximum to minimum
 (B) The range of measured variables from set value
 (C) The range of measured variables through which the air output changes from maximum to minimum
 (D) None of the above
16. The terms in the first column of the Routh array of the characteristic equation of a certain system are 4, 7, 6, -5, -4, -3. The number of roots of the characteristic equation in the right half of the s-plane is equal to
- (A) 2
 (B) 1
 (C) 3
 (D) 0
17. Which is not a final control element?
- (A) Control valve
 (B) Potentiometer
 (C) Electro-pneumatic converter
 (D) Servomotor
18. A signal other than the reference input that tends to affect the value of controlled variable is known as
- (A) disturbance
 (B) command
 (C) control element
 (D) reference input
19. A large time constant corresponds to a
- (A) sluggish system
 (B) faster system
 (C) over-damped system
 (D) underdamped system
20. Due to integral control the order of a control system is
- (A) increased
 (B) decreased
 (C) not affected
 (D) None of these
21. When using the terms "accuracy" and "precision" for measurements
- (A) "precision" implies less measurement error than "accuracy"
 (B) "accuracy" implies less measurement error than "precision"
 (C) "precision" measures the repeatability of a measurement
 (D) both terms mean the same thing
22. Sinusoidal oscillators are
- (A) stable
 (B) marginally stable
 (C) unstable
 (D) conditionally stable

23. If the carrier of a 100 percent modulated AM wave is suppressed, the percentage power saving will be
- 50
 - 150
 - 100
 - 66.66
24. Frequencies in the UHF range normally propagate by means of
- ground waves
 - sky waves
 - surface waves
 - space waves
25. Indicate the three types of transmission line energy losses.
- I^2R , R , and temperature L
 - Radiation, I^2R , and dielectric heating
 - Dielectric separation, insulation breakdown, and radiation
 - Conductor heating, dielectric heating, and radiation resistance
26. The coil of a moving iron instrument has a resistance of 500Ω and an inductance of 1 H. It reads 250 V when a 250 V dc is applied. If series resistance is 2000Ω , its reading when fed by 250 V, 50 Hz ac will be
- 260 V
 - 252 V
 - 250 V
 - 248 V
27. For the measurement of low resistances, Kelvin's double bridge has high accuracy because
- it has two set of ratio arms which eliminates effect of resistance of connecting lead
 - it has a null indicating galvanometer
 - it has two null indicator
 - it has four sets of ratio arms which eliminates the effect of resistance of connecting lead
28. Indicate the false statement. The SWR on a transmission line is infinity; the line is terminated in
- a short circuit
 - a complex impedance
 - an open circuit
 - a pure reactance
29. The output voltage of a typical thermocouple is
- Less than 100 mV
 - Greater than 1 V
 - Thermocouples vary resistance, not voltage
 - None of the above
30. The change in value of an analog signal during the conversion process produces what is called the
- Quantization error
 - Resolution error
 - Nyquist error
 - Sampling error
31. What does a Hall Effect sensor sense?
- Temperature
 - Moisture
 - Magnetic fields
 - Pressure
32. What type of application would use a photovoltaic cell?
- An automobile horn
 - A TI 92 calculator
 - A magnetic field detector
 - A remote power source
33. A measure of the repeatability of a measurement of some quantity is
- error
 - precision
 - accuracy
 - significant

34. Four terminal resistors are used for resistance values
- (A) Greater than $10\ \Omega$
 - (B) Greater than $1\ \Omega$
 - (C) Less than $1\ \Omega$
 - (D) Of the order of $1\ M\Omega$
35. Which of the following is a desirable characteristic of an instrument?
- (A) High drift
 - (B) High fidelity
 - (C) Poor reproducibility
 - (D) High measuring lag
36. The of a vapor pressure thermometer is a functioning element.
- (A) pointer
 - (B) bourdon tube
 - (C) bulb
 - (D) None of these
37. Which of the following is not the triple point of water ?
- (A) 32 F
 - (B) 32 R
 - (C) 492 R
 - (D) 273 K
38. Flapper nozzle is used in a/an controller.
- (A) Electronic
 - (B) Pneumatic
 - (C) Hydraulic
 - (D) None of these
39. Which of the following relates the emf generated in a single homogeneous wire to the temperature difference ?
- (A) Seebeck effect
 - (B) Peltier effect
 - (C) Thomson effect
 - (D) None of these
40. Response of a system to a sinusoidal input is called response.
- (A) Impulse
 - (B) Frequency
 - (C) Unit step
 - (D) None of these
41. Working principle of radiation pyrometer is based on the
- (A) Wien displacement law
 - (B) Kirchhoff's law
 - (C) Stefan-Boltzmann law
 - (D) Seebeck effect
42. Pick out the first order system from among the following.
- (A) Interacting system of two tanks in series
 - (B) Non-interacting system of two tanks in series
 - (C) Damped vibrator
 - (D) Mercury in glass thermometer kept in boiling water
43. A negative gain margin expressed in decibels means a/an system.
- (A) stable
 - (B) unstable
 - (C) critically damped
 - (D) None of these
44. Smoke density of the flue gas going out of the chimney is measured by a
- (A) thermal conductivity meter
 - (B) polarograph
 - (C) photo electric cell
 - (D) chromatograph
45. An ammeter of 0-25 A range has a guaranteed accuracy of 1% of full scale reading. The current measured is 5 A. The limiting error is
- (A) 2%
 - (B) 2.5%
 - (C) 4%
 - (D) 5%

46. To increase Q factor of a coil, wire should be
- (A) thick
 - (B) long
 - (C) thin
 - (D) long and thin
47. A spring mass system represent a
- (A) Zero order
 - (B) First order
 - (C) Second Order
 - (D) Third order
48. In 3 phase power measurement by two wattmeter method, the reading of one wattmeter is zero. The power factor of load is
- (A) 1
 - (B) 0.5
 - (C) 0
 - (D) 0.8
49. In a CRO which of the following is not a part of electron gun
- (A) Cathode
 - (B) Grid
 - (C) Accelerating anode
 - (D) X-Y Plate
50. Potentiometer transducers are used for the measurement of
- (A) Pressure
 - (B) Displacement
 - (C) Humidity
 - (D) Both (A) and (B)

Section C (30 Marks)

Answer any 5 (five) from the following

1. Explain how an optical fiber can be used as a Level sensor. Distinguish between single mode & multimode optical fiber sensor? (Marks : 4 + 2 = 6)

2. Explain the working principle of a servomotor. How a DC motor can be controlled by a digital control system? (Marks : 3 + 3 = 6)

3. Discuss with necessary schematic a scheme to get 100 mV/°C from a temperature sensor which gives 1μA/K. (Marks : 6)

4. What is two level and three level LASER? Describe production of Ruby laser. (Marks : 3 + 3 = 6)

5. What are the different FPGA technologies? Explain each briefly. (Marks : 2 + 4 = 6)

6. Distinguish between X-ray Diffraction and X-ray fluorescence. Discuss their applications in instrumentation? (Marks : 3 + 3 = 6)

Space for Answers (Section C) : for Questions 1 to 6 (10 pages)

GU-RRET 2018

Space for Answers (Section C) : for Questions 1 to 6 (10 pages)

GU-RRET 2019

Space for Answers (Section C) : for Questions 1 to 6 (10 pages)

GU-RREF 2018

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GU-RRET 2019

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