

# UPSC

## Engineering Services Examination - 2014

Held on 21-6-2014

ELECTRICAL ENGINEERING  
Paper II

B

Time Allowed : Two Hours

Maximum Marks : 200

### INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET **DOES NOT** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. PLEASE NOTE THAT IT IS THE CANDIDATE'S RESPONSIBILITY TO ENCODE AND FILL IN THE ROLL NUMBER AND TEST BOOKLET SERIES CODE A, B, C OR D CAREFULLY AND WITHOUT ANY OMISSION OR DISCREPANCY AT THE APPROPRIATE PLACES IN THE *OMR* ANSWER SHEET. ANY OMISSION/DISCREPANCY WILL RENDER THE ANSWER SHEET LIABLE FOR REJECTION.
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. **DO NOT** write *anything else* on the Test Booklet.
4. This Test Booklet contains 120 items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. 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.
5. You have to mark your responses **ONLY** on the separate Answer Sheet provided. See directions in the Answer Sheet.
6. All items carry equal marks.
7. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator *only the Answer Sheet*. You are permitted to take away with you the Test Booklet.
9. Sheets for rough work are appended in the Test Booklet at the end.
10. **Penalty for wrong Answers :**  
THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE.
  - (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, one-third (0-33) of the marks assigned to that question will be deducted as penalty.
  - (ii) If a candidate gives more than one answer, it will be treated as wrong answer even if one of the given answers happens to be correct and there will be same penalty as above to that question.
  - (iii) If a question is left blank i.e., no answer is given by the candidate, there will be no penalty for that question.

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1. Which of the following are the advantages of FM over AM?

1. Better noise immunity is provided
2. Lower bandwidth is required
3. Transmitted power is more useful
4. Less modulating power is required

- (a) 1, 2 and 3  
(b) 1, 2 and 4  
(c) 2, 3 and 4  
(d) 1, 3 and 4

2. Consider the following statements comparing delta modulation (DM) with PCM system:

DM requires

1. A lower sampling rate
2. A higher sampling rate
3. A higher bandwidth
4. Simple hardware

Which of the above statements are correct?

- (a) 1 and 3 only  
(b) 2 and 4 only  
(c) 1, 3 and 4  
(d) 2, 3 and 4

3. In a radio receiver, AGC works by

- (a) Tuning the local oscillator  
(b) Turning off the audio section in the absence of a received signal  
(c) Adjusting the gain of RF and IF amplifiers  
(d) Limiting the signal level using a clipper in the audio section

4. The correct sequence of operations which a regenerative repeater performs is

- (a) Timing information extraction, equalization and decision making  
(b) Equalization, Timing information extraction and decision making  
(c) Timing information extraction, decision making and equalization  
(d) Equalization, decision making and Timing information extraction

5. In a typical AM receiver circuit, the oscillator frequency is

- (a) Same as signal frequency  
(b) Always equal to 455 Hz  
(c) Lower than the signal frequency by 455 kHz  
(d) Higher than the signal frequency by 455 kHz

6. A TDM link has 20 signal channels and each channel is sampled at 8 kHz. Each sample is represented by 7 bits and contains an additional bit for synchronization. The total bit rate for the TDM link is

- (a) 1128 kbps
- (b) 1180 kbps
- (c) 1280 kbps
- (d) 128 Mbps

7. A scheme in which several channels are interleaved and then transmitted together is known as

- (a) Frequency division multiplexing
- (b) Time division multiplexing
- (c) A group
- (d) A super group

8. The secondary TDM level provides

- (a) 24-channels in  $\mu$ -law systems and 30 channels for a-law systems
- (b) 48-channels in  $\mu$ -law systems and 96 channels for a-law systems
- (c) 96-channels in  $\mu$ -law systems and 120 channels for a-law systems
- (d) 128-channels in  $\mu$ -law systems and 200 channels for a-law systems

9. In a Frequency Division Multiplexed (FDM) system, cross talk occurs due to

- (a) Imperfect time synchronization between transmitter and receiver
- (b) Imperfect filtering at the receiver front-end

(c) Imperfect carrier recovery at the receiver

(d) Channel noise

10. Which one of the following power semiconductor device has bi-directional current capability?

- (a) SCR
- (b) MOSFET
- (c) IGBT
- (d) TRIAC

11. Consider the following statements:

SCR can be turned on by

1. Applying anode voltage at a sufficiently fast rate
2. Applying sufficiently large anode voltage
3. Increasing the temperature of SCR to sufficiently large value
4. Applying sufficiently large gate current

Which of the above statements are correct?

- (a) 1, 2 and 3
- (b) 1, 3 and 4
- (c) 1, 2 and 4
- (d) 2, 3 and 4



12. Turn on time of an SCR can be reduced by using a
- Rectangular pulse of high amplitude and narrow width
  - Rectangular pulse of low amplitude and wide width
  - Triangular pulse
  - Trapezoidal pulse
13. Which of the following is the fastest switching device?
- JFET
  - BJT
  - MOSFET
  - Triode
14. Which of the following does not cause damage of an SCR?
- High current
  - High rate of rise of current
  - High temperature rise
  - High rate of rise of voltage
15. For the V-I characteristics of an SCR, which of the following statements are correct?
- It will trigger when the applied voltage is more than the forward break over voltage
  - Holding current is greater than latching current
  - When reverse biased, a small value of leakage current will flow
  - It can be triggered without gate current
- 1, 2 and 3
  - 1, 3 and 4
  - 1, 2 and 4
  - 2, 3 and 4
16. Which of the following transistors is symmetrical in the sense that emitter and collector or source and drain terminals can be interchanged?
- JFET
  - MOSFET
  - NPN transistor
  - PNP transistor
17. The snubber circuit used to shape the turn-on switching trajectory of thyristor and/or to limit  $\frac{di}{dt}$  during turn on is
- L - R snubber polarized
  - R - C snubber polarized
  - R - C snubber unpolarized
  - L - R snubber unpolarized

18. In a forward converter, a tertiary winding is used. What is the reason?

- (a) To provide  $\frac{di}{dt}$  protection to the switching device
- (b) To provide  $\frac{dv}{dt}$  protection to the switching device
- (c) To provide electrical isolation between the input and output
- (d) To demagnetize the core before the application of the next switching pulse

19. Consider the following statements:

Phase controlled converters at small values of output voltage have

1. Large harmonics in utility system
2. Poor power factor
3. High efficiency
4. Notches in line voltage waveform

Which of the above statements are correct?

- (a) 1 and 2 only
- (b) 1, 2 and 4
- (c) 2, 3 and 4
- (d) 1 and 4 only

20. Which of the following regulator provides output voltage polarity reversal without a transformer?

- (a) Buck regulator
- (b) Boost regulator
- (c) Buck-Boost regulator
- (d) CUK regulator

21. A 200/100 V, 50 Hz transformer is to be excited at 40 Hz from the 100 V side. For the exciting current to remain same, the applied voltage should be

- (a) 150 V
- (b) 125 V
- (c) 100 V
- (d) 80 V

22. A single-phase two winding transformer is designed to operate at 400/200 V, 50 Hz. If the h.v. side is now energized from a 400 V, 40 Hz source, the no-load l.v. side voltage would be

- (a) 300 V
- (b) 250 V
- (c) 200 V
- (d) 150 V

23. A 100 VA, 120/12 V transformer is to be connected so as to form a step-up transformer. A Primary voltage of 120 V is applied to the transformer. What is the secondary voltage of the transformer?

- (a) 1.2 V
- (b) 12 V
- (c) 120 V
- (d) 132 V

$$K = \frac{V_1}{V_2} = \frac{120}{12} = 10$$



24. In a transformer, if the iron losses and copper losses are 40.5 kW and 50 kW respectively, then at what fraction of load will the efficiency be maximum?
- (a) 0.80  
(b) 0.57  
(c) 0.70  
(d) 0.90
25. In a transformer the core loss is 100 Watt at 40 Hz and 72 Watt at 30 Hz, then eddy current and hysteresis losses at 50 Hz respectively are
- (a) 25 Watt and 105 Watt  
(b) 20 Watt and 100 Watt  
(c) 100 Watt and 32 Watt  
(d) 32 Watt and 100 Watt
26. The voltage regulation of a transformer having 2% resistance and 5% reactance, at full load, 0.8 pf lagging is
- (a) 4.6%  
(b) -4.6%  
(c) -1.4%  
(d) 6.4%
27. If the percentage impedances of the two transformers working in parallel are different then
- (a) Transformers will be overheated  
(b) Power factors of both the transformers will be same  
(c) Parallel operation will not be possible  
(d) Parallel operation will still be possible
28. "A time-varying flux causes an induced electromotive force". What law does this statement represent?
- (a) Ampere's law  
(b) Faraday's law  
(c) Lenz's law  
(d) Field form of Ohm's law
29. Assuming a uniform distribution of current over the armature surface conductors, the shape of the resultant armature m.m.f. in space of a loaded dc machine is a symmetrical
- (a) Triangular wave with its peak along the inter-polar axis  
(b) Triangular wave with its peak along the pole axis  
(c) Rectangular wave with its central axis coinciding with the inter-polar axis  
(d) Rectangular wave with its central axis coinciding with the pole axis
30. A dc series motor with a resistance between terminals of  $1 \Omega$ , runs at 800 rpm from a 200 V supply taking 15 A. If the speed is to be reduced to 475 rpm for the same supply voltage and current the additional series resistance to be inserted would be approximately
- (a)  $2.5 \Omega$   
(b)  $3 \Omega$   
(c)  $4.5 \Omega$   
(d)  $5 \Omega$



31. A dc series motor of resistance  $1\ \Omega$  across terminals runs at 1000 rpm at 250 V taking a current of 20 A. When an additional resistance of  $6\ \Omega$  is inserted in series and taking the same current, the new speed would be
- 142.8 rpm
  - 166.7 rpm
  - 478.3 rpm
  - 956.6 rpm
32. Damper bars in case of Salient Pole Rotors of hydro-alternators are usually inserted in pole faces to
- Strengthen the excitation current of the poles
  - Damp out the rotor oscillations during transient state owing to sudden change in load conditions
  - Help improve the power factor of load
  - Reduce the no-load current when load is thrown-off
33. In synchronous motor, 'V' curves present the variation of
- Armature current with excitation (field)
  - Armature current with maximum power developed
  - Field excitation with stalling torque
  - Field excitation with minimum power developed
34. The synchronous reactance of a 500 V, 50 kVA alternator having an effective resistance of  $0.2\ \Omega$ , if an excitation current of 10 A produces 200 A armature current on short circuit and an emf of 450 volts on open circuit, is
- $2.6\ \Omega$
  - $5.2\ \Omega$
  - $2.24\ \Omega$
  - $4.5\ \Omega$
35. The main advantage of distributing the winding in slots is to
- Reduce the size of the machine
  - Add mechanical strength to the winding
  - Reduce the amount of copper required
  - Reduce the harmonics in the generated emf
36. When the rotor speed, in a synchronous machine, becomes more than the synchronous speed during hunting, the damper bars develop
- Induction motor torque
  - Induction generator torque
  - Synchronous motor torque
  - DC motor torque

37. In a split phase motor, the running winding should have
- High resistance and low inductance
  - High resistance as well as high inductance
  - Low resistance and high inductance
  - Low resistance as well as low inductance
38. A 3-phase induction motor draws 50 kW from a 220 V, 50 Hz mains. The rotor emf makes 100 oscillations/minute. If the stator losses are 2 kW the rotor copper loss would be
- $$s = \frac{P_r}{P} = \frac{50}{100 \times 50} = 0.02$$
- $$P_{sc} = 50 \times 0.02 = 1.0 \text{ kW}$$
- $$P_{rc} = 1.0 \times 0.02 = 0.02 \text{ kW}$$
- $$P_{rc} = 0.02 \text{ kW}$$
- 0.16 kW
  - 0.32 kW
  - 1.6 kW
  - 3.2 kW
39. Starting torque can be obtained in the case of a single phase induction motor with identical main and auxiliary windings by connecting
- A capacitor across the mains
  - A capacitor in series with the machine
  - A capacitor in series with the auxiliary winding
  - The main and the auxiliary winding in series
40. The ratio of starting to full load current for a 10 kW, 400 V, 3-phase induction motor with star delta starter, given the full load efficiency as 0.86, the full load pf is 0.8 and short circuit current is 30 A at 100 V is
- 1.9
  - 1.8
  - 2.4
  - 3.2
41. In a 3- $\phi$  controller bridge rectifier, the maximum conduction of each Thyristor is
- 60°
  - 90°
  - 120°
  - 150°
42. A line commutated phase-controlled inverter is operating at its inverter limit. There can be a commutation failure if
- The frequency decreases
  - The voltage increases
  - The frequency increases
  - Both voltage and frequency change such that  $v/f$  is constant



43. A single phase, voltage source, square wave inverter feeds a pure inductive load. The waveform of the current will be

- (a) Sinusoidal
- (b) Rectangular
- (c) Trapezoidal
- (d) Triangular

44. What should be the frequency modulation ratio ( $m_f$ ) for a 3-phase inverter if the  $m_f$ th harmonic and its odd multiples are to be suppressed in the line-to-line voltages?

- (a)  $m_f$  should be odd
- (b)  $m_f$  should be even
- (c)  $m_f$  should be an odd multiple of 3
- (d)  $m_f$  should be even multiple of 3

45. The device used for switching in a switched Mode Power supply is

- (a) Diode
- (b) Thyristor
- (c) GTO
- (d) MOSFET

**Directions :**

Each of the next **Fifteen (15)** items consists of two statements, one labelled as the 'Statement (I)' and the other as 'Statement (II)'. You are to examine these two statements carefully and select the answers to these items using the codes given below :

**Codes :**

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is *not* the correct explanation of Statement (I)
- (c) Statement (I) is true but Statement (II) is false
- (d) Statement (I) is false but Statement (II) is true

46. Statement (I) : Size of power transformer is inversely proportional to the operation frequency.

Statement (II) : Copper loss is proportional to frequency.

47. Statement (I) : In a dc shunt generator the 'build-up' induced voltage, at its terminals, is given by the intersection point of the Field Resistance Line (FRL) with the No-Load Characteristics (NLC) of the machine.

Statement (II) : The generator fails to build up any voltage at its terminals, when the slope of the FRL is higher than that of the straight line portion of the NLC.



48. Statement (I) : The 'Rating' of alternators is determined by their heating, and hence, the losses in them.

Statement (II) : Along with the voltage, frequency and MVA the operating minimum lagging power-factor has also to be included in the Rating specifications.

49. Statement (I) : The no load current drawn by the induction motor is usually more than that of a transformer.

Statement (II) : An induction motor can be considered as a generalized transformer.

50. Statement (I) : The speed control of induction motor by pole changing is suitable for cage motors only.

Statement (II) : The cage rotor automatically develops number of poles equal to the poles of stator winding.

51. Statement (I) : In high head hydel stations, the action of governor due to sudden change in load, changes the water admitted to turbine blades leading to water hammering effect on penstocks.

Statement (II) : A surge tank in high head hydel stations is used to absorb the flow variations.

52. Statement (I) : As applied to flip flops, asynchronous inputs are overriding inputs.

Statement (II) : Direct inputs of flip flops are effective even in the absence of the control/clock input.

53. Statement (I) : ECL circuit has the highest speed of any of the currently available logic circuits.

Statement (II) : It is a fact that transistors never operate fully saturated or cut-off.

54. Statement (I) : The collection of all state variables (memory element stored values) at any time, contain all the information about the past, necessary to account for the circuit's future behaviour.

Statement (II) : A change in the stored values in memory elements changes the sequential circuit from one state to another.

55. Statement (I) : Segment Override Prefix (SOP) is used when a default offset register is not used with its default base segment register, but with a different base register.

Statement (II) : The offset registers IP and SP can never be associated with any other segment registers apart from their respective default segments.



56. Statement (I) : Branch instructions in a microprocessor are used to change the sequence of program.

Statement (II) : All logical instructions are branch instructions.

57. Statement (I) : PAM, PWM and PPM modulation belong to analog modulation and the PCM modulation belongs to the digital modulation.

Statement (II) : PAM, PWM and PPM modulation are similar to AM, FM and PM modulation.

58. Statement (I) : High frequency DSB is obtained in practice using two AM modulators arranged in a balanced configuration.

Statement (II) : Perfect square-law devices are difficult to design.

59. Statement (I) : The 'turn on' and 'turn off' time of a MOSFET is very small.

Statement (II) : The MOSFET is a majority-carrier device.

60. Statement (I) : For the same voltage output, the power factor of a single phase semi converter is better than a full converter.

Statement (II) : The single phase semi converter uses two diodes and two controlled switches.

61. The thermal and electrical efficiencies of a 100 MW steam station are respectively 30% and 92%. The coal used has a calorific value of 6400 kcal/kg. For the supply of full-load rated capacity the coal consumption in kg/hour would be approximately

(a) 24340

(b) 32450

(c) 48690

(d) 64910

62. Compared to turbines in conventional coal-fired thermal stations, nuclear power plant turbines use steam at

(a) Lower pressure and temperature

(b) Higher pressure and temperature

(c) Lower pressure and higher temperature

(d) Higher pressure and lower temperature

63. A generating station has 500 MW maximum demand and annual load factor of 50%, capacity factor of 40%. The reserve capacity of the plant is

(a) 125 MW

(b) 625 MW

(c) 500 MW

(d) 725 MW



64. The power transmission capability of bipolar lines is approximately
- Half that of 3-phase single circuit line
  - Same as that of 3-phase single circuit line
  - Twice that of 3-phase single circuit line
  - Thrice that of 3-phase single circuit line
65. The term 'Surge Tank' is associated with which type of power plant?
- High head hydro
  - Low head hydro
  - Medium head hydro
  - Thermal
66. Equal area criteria in power systems is used in the context of
- Deciding maximum loading for a given excitation
  - Stability of a machine connected to infinite bus bar
  - Stability of power systems in which many machines are connected to infinite bus bar
  - Load distribution between a single machine and load drawn from infinite bus bar
67. In the core-type two-winding transformer, the low-voltage winding is placed adjacent to the steel core, in order to
- Facilitate dissipation of heat during the operation of the transformer
  - Minimize the amount of insulation required
  - Reduce the chances of axial displacement with respect to the high-voltage winding placed outside
  - Reduce the mutual radial stress between the two windings
68. Transient state stability is generally improved by
- Using high speed governors on machines
  - Using low inertia machines
  - Dispensing with neutral grounding
  - Any of the above
69. In a power system, which of the following is/are critical clearance time of a fault related to?
- Transient reactance
  - Sub-transient reactance
  - Reactive power limit
  - Transient stability limit
- 1 and 2
  - 2 only
  - 3 and 4
  - 4 only



70. A relay is connected to a 400/5 A current transformer and set for 150%. The primary fault current of 2400 A needs a plug setting multiplier of

- (a) 2
- (b) 4
- (c) 6
- (d) 8

$$\frac{2400}{\frac{400}{5} \times 1.5} = \frac{2400}{160} = 15$$

$$\frac{2400}{160} = 15$$

$$\frac{2400}{160} = 15$$

$$\frac{2400}{160} = 15$$

71. An over-current relay is said to over reach when it operates at a current

- (a) Higher than its setting
- (b) Equal to its setting
- (c) Lower than its setting
- (d) 2/3rd of its setting

72. The use of high speed circuit breakers

- (a) Reduces the short circuit current
- (b) Improves the system stability
- (c) Decreases the system stability
- (d) Increases short circuit current

73. Consider the following statements :

The intrinsic carrier concentration of a semiconductor

1. Depends on doping
2. Increases exponentially with decrease of band gap of the semiconductor
3. Increases non-linearly with increase of temperature
4. Increases linearly with increase of temperature

Which of the above statements are correct ?

- (a) 1, 2 and 3
- (b) 1 and 2 only
- (c) 2 and 3 only
- (d) 2 and 4 only

74. The concentration of minority carriers in an extrinsic semiconductor under equilibrium is

- (a) Directly proportional to doping concentration
- (b) Directly proportional to intrinsic concentration
- (c) Inversely proportional to doping concentration
- (d) Inversely proportional to intrinsic concentration



75. The CE short circuit current gain,  $\beta$  of a transistor

- (a) is a monotonically increasing function of the collector current,  $I_C$
- (b) is a monotonically decreasing function of  $I_C$
- (c) for low values of  $I_C$ , it increases and reaches a maximum and then decreases with further increase in  $I_C$
- (d) is not a function of  $I_C$

76. For forward biased diode

- (a) Transition capacitance is larger than diffusion capacitance
- (b) Diffusion capacitance is larger than transition capacitance
- (c) Both capacitances are having same value
- (d) Cannot predict with certainty

77. Consider the following steps in the fabrication of a monolithic bipolar junction transistor :

1. Emitter diffusion
2. Base diffusion
3. Buried layer formation
4. Epi-layer formation

What is the correct sequence of these steps ?

- (a) 1, 2, 3 and 4
- (b) 4, 2, 3 and 1
- (c) 1, 3, 2 and 4
- (d) 4, 3, 2 and 1

78. In a  $p-n$  junction diode under reverse bias, the magnitude of electric field is maximum at

- (a) The edge of the depletion region on the  $p$  side
- (b) The edge of the depletion region on the  $n$  side
- (c) The  $p-n$  junction
- (d) The centre of the depletion region on the  $n$  side

79. Consider the following statements regarding a differential amplifier using an FET pair. The differential output offset voltage is due to :

1. Mismatch between FET parameters
2. Difference between the values of resistors used in the circuit even though they are marked nominally equal
3. Variation in the operating voltage of the circuit

Which of the above statements are correct ?

- (a) 1, 2 and 3
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1 and 2 only



80. As compared to an LED, an LCD has the distinct advantage of

- (a) Extremely low power consumption
- (b) Providing a silver display
- (c) Being extremely thin
- (d) Giving two types of displays

81. With reference to 8085 microprocessor, which of the following statements are correct?

- 1. INR is 1-byte instruction
- 2. OUT is 2-byte instruction
- 3. STA is 3-byte instruction

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

82. Consider the following registers:

- 1. Accumulator and flag register
- 2. B and C registers
- 3. D and E registers
- 4. H and L registers

Which of these 8-bit registers of 8085  $\mu P$  can be paired together to make a 16-bit register?

- (a) 1, 3 and 4
- (b) 2, 3 and 4
- (c) 1, 2 and 3
- (d) 1, 2 and 4

83. The first microprocessor to include virtual memory in the Intel microprocessor family is

- (a) 80286
- (b) 80386
- (c) 80486
- (d) Pentium

84. In 8085 microprocessor, which mode of addressing does the instruction CMP M use?

- (a) Direct addressing
- (b) Register addressing
- (c) Indirect addressing
- (d) Immediate addressing

85. Which of the following 8085 instruction will require maximum T-states for execution?

- (a) XRI byte
- (b) STA address
- (c) CALL address
- (d) JMP address

86. How many machine cycles are required by STA instruction?

- (a) 2
- (b) 3
- (c) 4
- (d) 5



87. Which of the following instructions is closest match to the instruction POP PC?

- (a) RET
- (b) PCHL
- (c) POP PSW
- (d) DAD SP

88. LOADER is a program that

- (a) Loads the mnemonics and generates a hex file
- (b) Loads the hex file and converts to the executable file
- (c) Loads the COM file and generates the binary code
- (d) Loads English like command and generates the binary code

89. Direct-Memory Access channel (DMA) facilitates data to move in and out of the system

- (a) On first-come first-serve basis
- (b) With equal time delay
- (c) Without a sub-routine
- (d) Without programme intervention

90. The address lines  $A_{15}$  to  $A_9$  of a micro-processor with 64 K memory capacity are connected to the chip select line of a  $512 \times 8$  EPROM through an AND gate. Its memory map ranges from 0000 to

- (a) 00FF
- (b) 03FF
- (c) 02FF
- (d) 01FF

91. A device or a peripheral equipment which is not in direct communication with CPU of a computer is called

- (a) Off line device
- (b) On line device
- (c) Active device
- (d) Slow device

92. Three devices A, B and C have to be connected to an 8085 microprocessor. Device A has highest priority and device C has the lowest priority. In this context, which of the following is correct assignment of interrupt inputs?

- (a) A uses TRAP, B uses RST 5.5 and C uses RST 6.5
- (b) A uses RST 7.5, B uses RST 6.5 and C uses RST 5.5
- (c) A uses RST 5.5, B uses RST 6.5 and C uses RST 7.5
- (d) A uses RST 5.5, B uses RST 6.5 and C uses TRAP



93. Which of the following data transfers is *not* possible in microprocessor?

- (a) Memory to accumulator
- (b) Accumulator to memory
- (c) Memory to memory
- (d) I/O device to accumulator

94. If the memory chip size is  $1024 \times 4$ , the number of memory chips required to design 8 k memory is

- (a) 8
- (b) 256
- (c) 16
- (d) 32

95. A 100 V carrier peak changes from 160 V to 40 V by a modulating signal. The modulation factor is

- (a) 0.3
- (b) 0.5
- (c) 0.6
- (d) 0.7

96. Which one of the following statements is *not* correct?

- (a) FM has infinite number of sidebands
- (b) Modulation index for FM is always greater than one ✓

(c) As modulation depth increases the BW increases

(d) As modulation depth increases the sideband power increases

97. A broadcast AM transmitter radiates 50 kW of carrier power. The radiation power at 85% of modulation is

- (a) 68.1 kW
- (b) 60.8 kW
- (c) 61.8 kW
- (d) 62.0 kW

98. Modulation has a number of advantages. Which one of the following is *not* correct?

- (a) Efficient transmission
- (b) Reduction in noise and interference
- (c) Overcomes hardware limitations
- (d) Requires higher power transmitter

99. In phase modulation, the frequency deviation is

- (a) Independent of the modulating signal frequency
- (b) Increasingly proportional to the modulating signal frequency
- (c) Directly proportional to the modulating signal frequency
- (d) Inversely proportional to the square root of the modulating signal frequency



100. A Pre-emphasis circuit provides extra noise immunity by

- (a) Boosting the base frequencies
- (b) Amplifying the higher audio frequencies
- (c) Pre-amplifying the whole audio band
- (d) Converting the phase modulation to FM

101. When a transistor is connected in common emitter mode it will have

- (a) Negligible input resistance and high output resistance
- (b) High input resistance and low output resistance
- (c) Medium input resistance and high output resistance
- (d) Low input resistance as well as output resistance

102. The bandwidth of an RC-coupled amplifier is limited by

- (a) Coupling capacitors at the low frequency end and bypass capacitors at the high frequency end
- (b) Coupling capacitors at the high frequency end and bypass capacitors at the low frequency end
- (c) Bypass and coupling capacitors at the low frequency end and device shunt capacitors at the high frequency end
- (d) Device shunt capacitors at the low frequency end and bypass as well as coupling capacitors at the high frequency end

103. Which one of the following systems gives the highest figure-of-merit (a measure of the noise performance)?

- (a) WBFM
- (b) NBFM
- (c) AM
- (d) SSB

104. The increase in value of  $\beta$  of transistor can cause the fixed bias circuit to

- (a) Shift from saturation region to active region
- (b) Shift the operation from active mode to saturation mode
- (c) Shift the operation from saturation mode to cutoff mode
- (d) Shift the operation from cutoff mode to active mode

105. The gain and distortion of an amplifier are respectively 150 and 5%. When used with a 10% negative feedback the % distortion would be

- (a) 5/16
- (b) 9/16
- (c) 6
- (d) 8

$A=150$   
 $\% \text{ distortion}$



106. A two stage amplifier with negative feedback

- (a) can become unstable for larger values of  $\beta$
- (b) becomes unstable at high and very low frequencies if A is very large
- (c) becomes unstable when the pole frequencies become complex
- (d) is always stable

107. In case of amplifiers, which coupling gives the highest gain?

- (a) Transformer coupling
- (b) Resistance coupling
- (c) Impedance coupling
- (d) Capacitance coupling

108. Active load is primarily used in the collector of the differential amplifier of an OPAMP

- (a) To increase the output resistance
- (b) To increase the differential gain A
- (c) To handle large signals
- (d) To provide symmetry

109. The pulse width out of a one shot multi-vibrator increases when the

- (a) Supply voltage increases
- (b) Timing resistor decreases
- (c) UTP decreases
- (d) Timing capacitance increases

110. In a dc machine, for the same number of slots and same current in the armature conductor, which one of the following will induce higher emf?

- (a) Lap winding
- (b) Wave winding
- (c) Compensating winding
- (d) Pole winding

111. If the output of a logic gate is '1' when all its inputs are at logic '0', the gate is either

- (a) A NAND or a NOR
- (b) An AND or an EX-NOR
- (c) An OR or a NAND
- (d) An EX-OR or an EX-NOR



112. Consider the following expressions :

$$1. Y = f(A, B, C, D) = \sum(1, 2, 4, 7, 8, 11, 13, 14)$$

$$2. Y = f(A, B, C, D) = \sum(3, 5, 7, 10, 11, 12, 13, 14)$$

$$3. Y = f(A, B, C, D) = \prod(0, 3, 5, 6, 9, 10, 12, 15)$$

$$4. Y = f(A, B, C, D) = \prod(0, 1, 2, 4, 6, 8, 9, 15)$$

Which of these expressions are equivalents of the expression

$$Y = A \oplus B \oplus C \oplus D?$$

(a) 1 and 2

(b) 1 and 4

(c) 2 and 3

(d) 1 and 3

113. Multiplexing scheme which uses carrier phase shifting and synchronous detection to permit two DSB signals to occupy the same frequency band is called

(a) NBFM

(b) CDMA

(c) QAM

(d) FDMA

114. In a  $5 \times 7$  dot matrix format

(a) 64 bits are required to store 64 alphanumeric characters

(b) 560 bits are required to store 64 alphanumeric characters

(c) 1120 bits are required to store 64 alphanumeric characters

(d) 2240 bits are required to store 64 alphanumeric characters

115. Ready pin of microprocessor is used

(a) To indicate that microprocessor is ready to receive inputs

(b) To indicate that microprocessor is ready to receive outputs

(c) To introduce wait state

(d) To provide direct memory access

116. A bus connected between the CPU and the main memory that permits transfer of information between main memory and the CPU is known as

(a) DMA bus

(b) Memory bus

(c) Address bus

(d) Control bus

117. A microprocessor is designed to access 2 k ROM, 4 k PROM and 64 k RAM. The number of address lines required to access these memories by the  $\mu P$  is

(a) 16

(b) 17

(c) 18

(d) 19

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118. Consider the following statements :

1. SRAM is made up of flip flops
2. SRAM stores bit as voltage
3. DRAM has high speed and low density
4. DRAM is cheaper than SRAM

Which of the above statements are correct ?

- (a) 1, 2 and 3
- (b) 1, 3 and 4
- (c) 2, 3 and 4
- (d) 1, 2 and 4

119. In order to generate continuous square wave using 8254 timer, it must be programmed in

- (a) mode 0
- (b) mode 1
- (c) mode 2
- (d) mode 3

120. The operations executed by two or more control units are referred as

- (a) Micro-operations
- (b) Macro-operations
- (c) Multi-operations
- (d) Bi control-operations



# Electrical Engineering Paper - II

Q.No.	A	B	C	D	Q.No.	A	B	C	D
1.	D	D	C	D	61.	D	C	C	D
2.	C	B	C	B	62.	B	A	C	C
3.	D	C	A	A	63.	A	A	D	D
4.	D	B	B	C	64.	C	B	C	D
5.	A	D	A	C	65.	C	A	D	A
6.	A	A	D	C	66.	C	B	B	A
7.	D	B	A	A	67.	A	B	C	D
8.	B	C	B	B	68.	B	A	D	B
9.	A	B	D	A	69.	D	D	B	A
10.	D	D	B	B	70.	D	B	A	D
11.	C	C	A	A	71.	A	C	A	C
12.	B	A	D	B	72.	B	B	A	B
13.	A	C	C	C	73.	C	C	A	A
14.	C	D	D	C	74.	C	C	B	C
15.	D	B	C	C	75.	C	C	B	D
16.	B	A	★	D	76.	D	B	B	B
17.	C	A	A	A	77.	A	D	B	C
18.	C	D	D	C	78.	C	C	B	C
19.	C	B	D	C	79.	C	★	B	C
20.	A	C	B	B	80.	B	A	B	A
21.	C	D	D	C	81.	D	D	C	C
22.	A	C	B	C	82.	B	B	A	C
23.	A	D	C	A	83.	C	A	A	D
24.	B	D	B	B	84.	B	C	B	C
25.	A	A	D	A	85.	D	C	A	D
26.	B	A	A	D	86.	A	C	B	B
27.	B	D	B	A	87.	B	A	B	C
28.	A	B	C	B	88.	C	B	A	D
29.	D	A	B	D	89.	B	D	D	B
30.	B	D	D	B	90.	D	D	B	A
31.	C	C	C	A	91.	C	A	C	A
32.	B	B	A	D	92.	A	B	B	A
33.	C	A	C	C	93.	C	C	C	A
34.	C	C	D	D	94.	D	C	C	B
35.	C	D	B	C	95.	B	C	C	B
36.	B	B	A	A	96.	A	D	B	B
37.	D	C	A	A	97.	A	A	D	B
38.	C	C	D	D	98.	D	C	C	B
39.	★	C	B	D	99.	B	C	★	B
40.	A	A	C	B	100.	C	B	A	B
41.	C	C	D	D	101.	C	C	D	C
42.	C	C	C	B	102.	C	C	B	A
43.	A	D	D	C	103.	D	A	A	A
44.	B	C	D	B	104.	C	B	C	B
45.	A	D	A	D	105.	D	A	C	A
46.	D	B	A	A	106.	B	D	C	B
47.	A	C	D	B	107.	C	A	A	B
48.	B	D	B	C	108.	D	B	B	A
49.	D	B	A	B	109.	B	D	D	D
50.	B	A	D	D	110.	A	B	D	B
51.	A	A	C	C	111.	A	A	A	C
52.	D	A	B	A	112.	A	D	B	B
53.	C	A	A	C	113.	A	C	C	C
54.	D	B	C	D	114.	B	D	C	C
55.	C	B	D	B	115.	B	C	C	C
56.	★	B	B	A	116.	B	★	D	B
57.	A	B	C	A	117.	B	A	A	D
58.	D	B	C	D	118.	B	D	C	C
59.	D	B	C	B	119.	B	D	C	★
60.	B	B	A	C	120.	B	B	B	A