



# UPPSC Polytechnic Lecturer Electrical Engineering

## Mega Mock Challenge

(October 26th - October 27th 2021)

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## Questions & Solutions

1. Kick fuses are used across relay coils to prevent relay operation during
- A. Heavy external faults
  - B. Inrush current of transformer when they are energised
  - C. Line to ground faults
  - D. Bolted faults

Ans. B

Sol. In order to prevent operation of differential protection due to inrush of magnetising current of transformer, the "kick fuses" are provided across the relay coils.

2. Differential relays are used for the protection of equipment against
- A. Internal faults
  - B. Over current
  - C. Reverse current
  - D. Reverse power

Ans. A

Sol. Differential relay works on the principle of difference between current entering and leaving the equipment. And hence it is insensible to external faults or changes.

3. A 3-phase circuit breaker is rated at 1250 A, 2000 MVA, 33 kV, 4s. It's making current capacity will be
- A. 35 kA
  - B. 89 kA
  - C. 79 kA
  - D. 69 kA

Ans. B

Sol. Making current = 2.55 x times breaking current

$$I_m = 2.55 \frac{(2000) \text{ MVA}}{33\sqrt{3} \text{ kV}}$$

$$= 89 \text{ kA}$$

4. In a static over-current relay, inverse time characteristics are obtained by
- A. A differentiating circuit
  - B. An integrating circuit
  - C. A transistor amplifier
  - D. A transistor switches

Ans. C

Sol. In a static over-current relay, inverse time characteristics are obtained by transistor amplifier

5. Mho relay is
- A. current restrained current relay.
  - B. voltage restrained directional relay.
  - C. current restrained directional relay.
  - D. voltage restrained current relay.

Ans. B

Sol. Torque equation is given by  $t = k_1 VI(\phi - \alpha) - k_2 V^2 - k_3$

The operating torque is provided by VI element while the restraining torque is provided by voltage element. Therefore a MHO relay can be called as voltage restrained directional relay.



Sol. A controller essentially is a comparator where the input and feedback are compared in order to produce an error signal.

10. Programming Languages for PLC is/are

- |                    |                           |
|--------------------|---------------------------|
| A. Ladder Diagram  | B. Function Block Diagram |
| C. Structured Text | D. All of the above       |

Ans. D

Sol. Programming Languages for PLC are all the given options ie.

Ladder Diagram (LD)

Sequential Function Charts (SFC)

Function Block Diagram (FBD)

Structured Text (ST)

Instruction List (IL)

11. Which one of the following is a non-maskable interrupt?

- |            |            |
|------------|------------|
| A. RST 7.5 | B. RST 6.5 |
| C. RST 5.5 | D. TRAP    |

Ans. D

Sol. TRAP is the non-maskable interrupt of microprocessor.

12. A balanced modulator is used for generation of which of the following?

- |                  |               |
|------------------|---------------|
| A. DSB-SC signal | B. FM signal  |
| C. PM signal     | D. PAM signal |

Ans. A

Sol. Balanced modulator is used for generation of DSB-SC signal.

13. A FM wave is give as  $v = 12 \sin (6 \times 10^8 t + \sin 1250 t)$ . Its carrier frequency is

- |              |              |
|--------------|--------------|
| A. 60.0 MHz  | B. 95.5 MHz  |
| C. 125.0 MHz | D. 276.3 MHz |

Ans. B

Sol. Standard form of FM wave =  $A \sin(\omega_c t + m_f \sin \omega_m t)$

$$\therefore \omega_c = 6 \times 10^8 = 600 \times 10^6$$

$$2\pi f_c = 600 \times 10^6 \Rightarrow f_c = 95.5 \text{ MHz}$$

14. The basic memory cell in a DRAM is a

- |                             |              |
|-----------------------------|--------------|
| A. MOSFET                   | B. Capacitor |
| C. Capacitor and MOS switch | D. Flip-Flop |

Ans. C

Sol. Capacitor along with MOS switch is basic memory cell in DRAM.

15. Which of the following are 3 byte instruction set?

- |                |               |
|----------------|---------------|
| A. MVI A, 32 H | B. JMP 2085 H |
| C. MOV C, A    | D. ADD B      |

Ans. B

Sol. IMP 2085 is an example of three by be instruction set.





Sol. Largest value of 8-bit digital input is  $11111111 = (255)_{10}$

For digital input of  $00110010: (55)_{10} = \text{output is } 1V$

So for digital input is  $11111111: (255)_{10} = \frac{255}{50} \times 1 = 5.1V$

25. Which of the following is equivalent to the Boolean function  $X + XY$ ?

- A. 0
- B. Y
- C. X
- D. 1

Ans. C

Sol.  $X + XY = X.(1 + Y) = X.1 = X$

26. The step angle of the stepper motor is  $2.5^\circ$ . If the stepping frequency is 3600 pulses per second, then the shaft speed will be

- A. 144 rps
- B. 3600 rps
- C. 25 rps
- D. 2.5 rps

Ans. C

Sol.

$$\begin{aligned} n &= \beta \times f / 360^\circ \\ &= 2.5 \times 3600 / 360^\circ \\ &= 25 \text{ rps} \end{aligned}$$

27. A shaded pole induction motor does not have the advantage of

- A. Rugged construction
- B. Low initial as well as maintenance cost
- C. High starting torque
- D. Comparatively small starting current

Ans. C

Sol. high losses, poor power factor and low starting torque are key features of shaded pole IM hence they are used in small applications.

28. Which of the following motors is used in household refrigerators?

- A. AC series motor
- B. DC shunt motor
- C. Reluctance motor
- D. Single phase induction motor

Ans. D

Sol. Single phase induction motor is used in household refrigerators.

29. A 2-phase, 4-phase permanent magnet stepper motor has a step of:-

- A.  $90^\circ$
- B.  $45^\circ$
- C.  $30^\circ$
- D. 22

Ans. A

Sol.  $\Delta\theta = \text{Step} = \left( \frac{N_s - N_r}{N_s \times N_r} \right) \times 360^\circ = \left( \frac{4 - 2}{4 \times 2} \right) \times 360^\circ$

$$\Delta\theta = 90^\circ$$

30. AC servo-motor is basically a

- A. Capacitor motor
- B. Two phase motor
- C. Three phase motor
- D. Universal motor

Ans. B





35. The maximum starting torque of a 3-phase induction motor occurs when:
- A. rotor resistance is 3/4th of the rotor reactance
  - B. rotor resistance is 1/4th of rotor reactance
  - C. rotor resistance is 1/2th of rotor reactance
  - D. rotor resistance is equal to rotor reactance

Ans. D

Sol. We know that  $T_{st} = \frac{3 \times 60}{2\pi N_s} \frac{E_2^2 R_2}{(R_2^2 + X_2^2)}$

For max starting Torque,  $\frac{dT_{st}}{dR_2} = 0$

After solving this, we get,  $R_2 = X_2$

36. A 3 phase induction motor runs at almost 1000 rpm at no load and 950 rpm at full load when supplied with power from a 50 Hz 3 phase line. The frequency of rotor voltage is:
- A. 2 Hz
  - B. 2.5 Hz
  - C. 250 Hz
  - D. 2.25 Hz

Ans. B

Sol.

$$\text{Rotor Frequency } f_r = \left( \frac{N_s - N_m}{N_s} \right) \times f_s$$

$$\text{Rotor Frequency } f_r = \left( \frac{1000 - 950}{1000} \right) \times 50$$

$$\text{Rotor Frequency } f_r = 2.5 \text{ Hz}$$

37. The type of noise reduced by limiters in FM receivers is
- A. Avalanche noise
  - B. Burst noise
  - C. Narrow band-pass noise
  - D. Impulse noise

Ans. D

Sol. if two or more signals are received at the same time, a high performance **limiter** stage can greatly **reduce** the effect of the weaker signals on the output. This is commonly referred to as the **FM** capture effect. The **limiter** also **reduces** the effect of impulse **noise** spikes.

38. Bandwidth occupied by 100 MHz carrier, AM modulated by signal frequency of 10 kHz is
- A. 100 MHz
  - B. 20 kHz
  - C. 10 kHz
  - D. 110 MHz

Ans. B

Sol. The bandwidth required for amplitude modulation is twice the frequency of the modulation signal.

$$BW = 2f_m = 2 \times 10 = 20 \text{ kHz}$$



43. Unit of the reluctance is \_\_\_\_\_?

- A. ohms  
B. A/m  
C. henry<sup>-1</sup>  
D. weber per ampere-turns

Ans. C

Sol.

$$\text{Reluctance } R_L = \frac{\text{mmf}}{\text{flux}}$$

$R_L$  = ampere-turn per weber

ohm is unit of resistance.

Unit of magnetic field strength  $H = A/m$

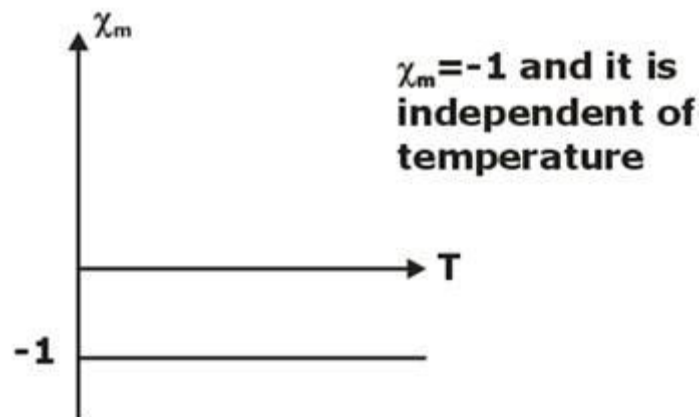
Unit of reluctance is ampere turn per weber or  $H^{-1}$  [henry]<sup>-1</sup>

44. For a Diamagnetic Material which of the following is correct ?

- A. Susceptibility is directly proportional to the temperature  
B. Susceptibility is inversely proportional to the temperature  
C. Susceptibility is independent of temperature  
D. None of these

Ans. C

Sol. For diamagnetic material



$\chi_m = -1$  and it is independent of temperature

45. If  $A \neq B$ , then the given Boolean expression results the minimized form,

$$f(A, B) = \overline{(\overline{A} + B)} + \overline{(A + \overline{B})} + \overline{(\overline{AB})(\overline{AB})}$$

- A. 1  
B. AB  
C. 0  
D.  $A \odot B$

Ans. A

Sol.

$$\begin{aligned} (A, B) &= \overline{(\overline{A} + B)} + \overline{(A + \overline{B})} + \overline{(\overline{AB})(\overline{AB})} \\ &= \left\{ \overline{(\overline{A}, B)}, \overline{(A + \overline{B})} \right\} + \left\{ \overline{(\overline{AB})} + \overline{(\overline{AB})} \right\} \end{aligned}$$



\* Grenade is lethal, safer and has a distinctive design that gives flexibility of employment in both defensive (fragmentation) and offensive (stun) modes.

\* It has a highly accurate delay time, very high reliability in usage and safe for carriage.

49. Defence Research and Development Organisation (DRDO) has handed over the first deliverable Firing Unit (FU) of Medium Range Surface to Air Missile (MRSAM) System to Indian Air Force (IAF). The missile has been jointly developed by DRDO and which aerospace manufacturer?

- A. Israel Aerospace Industries
- B. Lockheed Martin Corporation
- C. The Boeing Company
- D. MBDA
- E. Airbus Group

Ans. A

Sol. • Defence Research and Development Organisation (DRDO) has handed over the first deliverable Firing Unit (FU) of Medium Range Surface to Air Missile (MRSAM) System to Indian Air Force (IAF).

• MRSAM is an advanced network centric combat Air Defence System. It was jointly developed by DRDO and Israel Aerospace Industries (IAI) in collaboration with Indian industry consisting of private and public sectors as well as MSMEs. It is a surface-to-air-missile, 4.5m in length. Contract for MRSAM programme was signed in February 2009. Under the contract, IAF was to buy 450 MRSAMs and 18 firing units at the value of \$2bn.

50. Which act ended the "Trade Monopoly" of the East India Company?

- A. Regulating Act of 1773
- B. Pitt's India Act of 1784
- C. The Charter Act of 1833
- D. The Charter Act of 1813

Ans. D

Sol. It was the charter act of 1813 that ended the "Trade Monopoly" of the East India Company. However the company was allowed to continue their monopoly over the tea trade and the trade with China.

51. Apart from the Himalayan region, the forest soils occur which of the following?

- A. Western Ghats
- B. Eastern Ghats
- C. Southern Ghats
- D. Both A and B

Ans. D

Sol. Apart from the **Himalayan region**, the **forest soils** occur on **Western** and **Eastern Ghats** as well as in some parts of the **Peninsular plateau**.

52. In which year was Nationalist Congress Party (NCP) founded?

- A. 1949
- B. 1999
- C. 1972
- D. 1997

Ans. B

Sol. Nationalist congress party was founded on 25 may 1999. Its youth wing is the nationalist youth congress . Sharad pawar, P.A. Sangma and Tariq Anwar were the three leaders who were involved. Sharad Pawar was made the president and P.A. Sangma and Tariq Anwar



Sol. Ayodhya is also known as Saketa, is an ancient city of India, believed to be the birthplace of Rama and setting of the epic *Ramayana*. It is adjacent to Faizabad city in the central region of the Indian state of Uttar Pradesh. Ayodhya used to be the capital of the ancient Kosala Kingdom. It has an average elevation of 93 meters (305 feet).

57. Who is the Minister of Power in Uttar Pradesh Government?

- A. Dinesh Sharma
- B. Dharmpal Singh
- C. Shrikant Sharma
- D. Jai Pratap Singh

Ans. C

Sol. Shrikant Sharma is an Indian politician from the BJP. He is a Member of the Uttar Pradesh Legislative Assembly from Mathura Constituency in Mathura district. He was sworn in as a Minister of Power in Yogi Adityanath cabinet. He is also the head of Bharatiya Janata Party National Secretary.

58. Which district of Uttar Pradesh is going to get India's first freight village?

- A. Kannauj
- B. Varanasi
- C. Bijnor
- D. Mainpuri

Ans. B

Sol. India's first 'freight village' will be developed by the Inland Waterways Authority of India (IWAI) in Varanasi, Uttar Pradesh. The freight village, a one-of-its-kind infrastructure platform, will attract companies that require logistics services and can cluster to improve their competitiveness. This will allow relocation of retailers, warehouse operators and logistics service providers supplying the regional FMCG market. The facility will come around the proposed multi-modal terminal adjacent to the city on the banks of the Ganga.

59. **Direction:** Select the one which is different from the other three responses.

- A. 704, 11
- B. 256, 4
- C. 832, 13
- D. 310, 5

Ans. D

Sol.  $704 \div 11 = 64$

$$256 \div 4 = 64$$

$$832 \div 13 = 64$$

But,  $310 \div 5 = 62$

Thus, the odd one is 310, 5.

Hence, option D is correct.

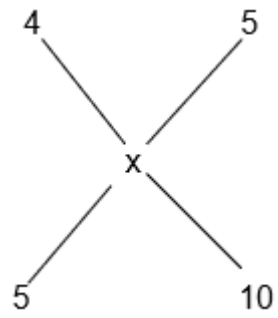
60. 5kg of Rice at Rs.4 per kg is mixed with 10kg of rice at Rs.5 per kg. find the average price of the mixture.

- A. 3.6
- B. 5.8
- C. 6.4
- D. 4.6

Ans. D

Sol. Let the average price of the rice be x,

Then,



$$(5-x)=(x-4)$$

$$\rightarrow (5-x)/(x-4)=5/10$$

$$\rightarrow 50-10x=5x-20$$

$$\rightarrow 70=15x$$

$$\rightarrow x=4.66$$

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