JUNIOR ENGINEER ELECTRICAL ENGINEERING EXAMINATION 2024 (PAPER-I)
(MEMORY BASED)

EXAM DATE	**05/06/2024**
EXAM TIME	**5:00 PM – 7:00 PM**
SUBJECT	**Junior Engineer 2024 Electrical Engineering**

SECTION A : ELECTRICAL ENGINEERING

Q.1. Which one of the following is not a discharge lamp?

(a) Incandescent lamp (b) Sodium vapour lamp

(c) Neon lamp (d) Mercury lamp

Sol. **(a)**

incandescent lamp is not a discharge lamp.

Q.2. Formula for transmission efficiency.

Sol. Percentage transmission efficiency $= \frac{P_R}{P_S} \times 100$

Q.3. Why we use back-to-back converter in doubly fed induction motor in wind power plant?

Sol. Traditional wind turbines have fixed turning speeds, while DFIG enables wind turbines to operate with various range of speeds. The back-to-back converter is connected to the rotor of the DFIG, and its purpose is to feed the rotor with currents of varying frequency, in order to reach the desired rotor speeds.

Q.4. According to maximum power transfer theorem what is the formula for maximum power

Sol. Formula for maximum power transfer is given by,

$$P_{\max} = \frac{V_{th}^2}{4R_{th}}$$

Where, V_{th} is Thevenin's voltage and R_{th} is Thevenin's resistance.

Q.5. Shunt arm Capacitance value in π model of medium transmission line is

Sol. $\frac{C}{2}$

Q.6. Maximum demand / connected load is

Sol. Demand factor $= \frac{\text{Maximum demand}}{\text{Sum of connected load}}$.

Q.7. Which type of damping is used in electrostatic instrument?

Sol. Fluid friction damping.

Q.8. Quality factor and bandwidth relation

Sol. $\text{Quality factor} = \dfrac{\text{Resonant frequency}}{\text{Bandwidth}}$

Q.9. By varying armature resistance, the speed of DC motor is controlled. This is known as:

Sol. Armature resistance control.

Q.10. When slip of induction motor is 1 then what is the rotor speed ?

Sol. Zero

Q.11. Torque of an induction motor is least affected by

(a) Diameter of rotor
(b) EMF of rotor
(c) Current in rotor
(d) Impedance of rotor

Sol. **(a)**

Diameter of rotor

Q.12. Which mechanism is not present in energy meter?

(a) Braking mechanism
(b) Driving mechanism
(c) Registering mechanism
(d) Damping mechanism

Sol. **(d)**

Damping mechanism

Q.13. Boiler efficiency = 34%, Generator efficiency = 94%. Overall efficiency of plant?

Sol. Overall efficiency = Boiler efficiency × Turbine efficiency × Generator efficiency

$= 0.34 \times 1 \times 0.94 = 31.96\%$

Q.14. In which region BJT works as OFF SWITCH?

Sol. Cut off region.

Q.15. Flux = $5t^2 + 10t - 20$ weber.

Current = 5A

What is the impedance at $t = 2$ sec

Sol. Given that,

$\phi = 5t^2 + 10t - 20$

$I = 5$ A

$$e = \frac{d\phi}{dt} = \frac{d}{dt}(5t^2 + 10t - 20) = 10t + 10$$

At $t = 2$ sec

$e = 10 \times 2 + 10 = 30$ V

$$Z = \frac{e}{I} = \frac{30}{5} = 6\ \Omega$$

ELECTRICAL ENGINEERING

Q.16. Mutual inductance depends on

Sol. We can conclude that mutual inductance depends upon the cross-sectional area of the common core. The number of their turns, and the permeability of the core.

Mutual inductance, $M = K\sqrt{L_1 \times L_2}$.

Where, K is coupling coefficient and L_1 and L_2 are self-inductance of the coils.

That means mutual inductance also depends on coupling coefficients.

Q.17. Formula for efficiency of thermal power plant.

Sol. Overall efficiency = Boiler efficiency × Turbine efficiency × Generator efficiency

Q.18. Number of electrons flowing per second in 1 ampere.

Sol. 6.25×10^{18} electrons.

Q.19. $I = 40$A, Length = 5 m, B = 1.4 T, $\theta = 30°$. Find the force exerted on conductor?

Sol. $F = I(\ell \times B) = I\ell B\sin\theta$

$= 40 \times 5 \times 1.4 \times \sin 30° = 140$ N

Q.20. Cold reserve capacity is

Sol. **Cold reserve:** It is the generating capacity which is available for service but not normally ready for immediate loading.

Hot reserve: It is the reserved capacity available and ready to use. This capacity is in operation but not in services.

Q.21. In step up transformer transformation ratio is _____ turn ratio.

(a) equal (b) less than

(c) greater than (d) None of these

Sol. **(b)**

Q.22. What is DC Signal?

(a) Positive Constant (b) Negative constant

(c) Varying with time (d) Positive or negative constant

Sol. **(d)**

DC signals are constant with respect to time. These signals are also known as unipolar signal.

Q.23. Error correction factor formula in EDM type wattmeter?

Sol. Correction factor $= \dfrac{\text{True power}}{\text{Measured power}} = \dfrac{\cos\phi}{\cos\beta \times \cos(\phi - \beta)}$.

Q.24. Current of $2\sin\omega t + 3\sin 3\omega t + 5\sin 5\omega t$ ampere is passed through hot wire meter find its reading?

Sol. $I = \sqrt{\dfrac{2^2 + 3^2 + 5^2}{2}} = \sqrt{\dfrac{38}{2}} = \sqrt{19} = 4.36$ A

Q.25. Why is starter used in induction motor?

Sol. In induction motor starter is used to limit the starting current.

Q.26. Two 20μF capacitors are connected in series and then parallel, what is the ratio of their series and parallel combination?

Sol. When connected in series, $C_{se} = 10\mu F$.

When connected in parallel, $C_{parallel} = 40\mu F$.

$$\frac{C_{se}}{C_{parallel}} = \frac{10}{40} = \frac{1}{4}.$$

Q.27. What is the value of reactive power in delta connected load having line voltage and line current of 400V and 100A , angle between voltage and current is 36.86°. Find its reactive power.

Sol. Reactive power, $Q = \sqrt{3}\, V_L I_L \sin\phi$

$= \sqrt{3} \times 400 \times 100 \times \sin 36.86°$

$= 41.569$ kVAR

Q.28. If the impedance of each phase in delta connection is $3\angle 30°\Omega$. What is the impedance of each phase in star?

Sol. $Z_y = \frac{Z_\Delta}{3}$

$= 1\angle 30°\Omega.$

Q.29. In DC motor, terminal voltage is 200V and current is 30 A , armature resistance is 0.5 ohm. What is back emf?

Sol. Back emf,

$E_b = V - I_a R_a = 200 - 30 \times 0.5 = 185$ V

Q.30. In Fleming right hand rule thumb represents.

Sol. In Fleming right hand rule thumb represents direction of rotation, index finger represents direction of magnetic field and middle finger represents direction of voltage or current.

Q.31. If input voltage is 200V, find voltage across capacitor at resonance in a series RLC circuit

R = 10Ω, L = 400H, C = 4 F

Sol. At resonance, $Q = \frac{wL}{R}$

$$\omega = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{400 \times 4}} = \frac{1}{40} \text{ r/s}$$

$$Q = \frac{\frac{1}{40} \times 400}{10} = 1$$

$$V_C = QV = 1 \times 200 = 200 \text{ volts}$$

ELECTRICAL ENGINEERING

Q.32. Controlling torque is produced by _____ in deflection type instrument

Sol. Spring control.

Q.33. 8 equal capacitors are connected in series having equivalent capacitance 20 μF. Find its capacitance.

Sol. $C_{eq} = \frac{C}{8}$

$20 \times 8 = C$

$C = 160\ \mu F$

Q.34. The unit of luminous intensity is equivalent to

Sol. The unit of luminous intensity is equivalent to Lumen / sr.

Q.35. $W_1 = 200W$, $W_2 = -35W$ in two wattmeter method.
What is the values of active and reactive power ?

Sol. $P = P_1 + P_2 = 200 + (-35) = 165\ W$

$Q = \sqrt{3}(P_1 - P_2) = \sqrt{3}[200 - (-35)]$

$= 235\sqrt{3} = 407.032\ \ VAR$

Q.36. What is the power factor of induction motor on low load?

Sol. Low power factor.

SECTION A : NON-TECH

Q.1. Article -76 delas with

Sol. Attorney General of India.

Q.2. What was the total number of recipient of Padma award for year 2023?

Sol.

2023	—	**106 award**
Padma Shri	—	91
Padma Bhushan	—	9
Padma Vibhushan	—	6
2024	—	**132 award**
Padma Shri	—	110
Padma Bhushan	—	17
Padma Vibhushan	—	5

Q.3. Kambola Festival is Celebrated —

Sol. It is an annula buffalo race in Karnataka. It is celebrated from November to March.

Q.4. Which is the longest river of Rajasthan?

Sol. Chambal river is the longest river.

Q.5. Who gave the slogan "Swaraj Mera Janam Sidh Adhikar Hai"?
Sol. Bal Gangadhar Tilak

Q.6. What is called the first war of Independence?
Sol. The revolt of 1897. It started on 10 May from Sepoy Mating in Meerut.

Q.7. Which article deal with allocation of Rajya Sabha seats?
Sol. Article 80
Maximum Strength of Rajya Sabha — 250
12 Members are nominated by the president 238 members are representative of the states and two union territories.

Q.8. Fourth Schedule of the constitution deals with —
Sol. Allocation of seats in the council of state for states and UTs.

Q.9. Who is appointed as the governor of Telangana is 2023?
Sol. C.P. Radha Krishan
After the resignation of Tamilisai Soundarajan she was the first femate to hold the office. C.P. Radha Krishan was the governor of Jharkhand. So he was given additional change of Telangana.

Q.10. Neiphia Rio has been elected as the chief minister of which state in 2023?
Sol. Nagaland.

Q.11. Which sport is never hosted by India.
Sol. Olympics

Q.12. 61st constitutional amendment is related to
Sol. 61st CAA, 1988 lowered the voting age of elections to Lok Sabha and to legislative assembly of states from 21 to 18 years.

Q.13. What is the height of Kanchanjunga mountain peak?
Sol. 8586 meter

Q.14. 84th Constitutional amendment, 2001 is related to
Sol. It froze the constitutecy boundaries till 2031. Existing total number of seats in Lok Sabha was based on 1971 censces.

Q.15. It Highest population state in India.
Sol. Uttar Pradesh
Uttar Pradesh > Maharastra > Bihar

Q.16. Pala Dynasty belong to which region?

Sol. Pala dynasty ruled Bihar and Bengal region in India from 8^{th} to 12^{th} century.

Q.17. Which state has the lowest population growth as per census 2011?

Sol. Kerala

Q.18. Part-IV of the Indian constitution deals with

Sol. Part-IV deals with directive principle of state policy.
Part-IV contrains Articel-36 to Articel-51.

Q.19. Laughing gas formula

Sol. Nitrous Oxide (N_2O) is called laughing gas.

Q.20. N_2O_5 Chemical Name.

Sol. Dinitrogen Pentaoxide or Nitric Anhydride.

Q.21. Who is the First Finance Minister of India?

Sol. Shanmukham Chetty

Q.22. 5 year plan start in which year?

Sol. 1951

Q.23. GFC Gass Banned in Which year?

Sol. 1987 Montreal Protocol.

Q.24. Kare was Soil found in which region of India?

Sol. Kashmir