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

EXAM DATE	**06/06/2024**
EXAM TIME	**1:00 PM – 3:00 PM**
SUBJECT	**Junior Engineer 2024 Electrical Engineering**

SECTION A : ELECTRICAL ENGINEERING

Q.1. Which of the following applications use shunt DC motors?

(a) Milling machines
(b) Hoists and elevators
(c) Elevators
(d) Electric locomotives

Sol. **(a)**

DC shunt motor is almost constant speed motor and its torque varies nearly as the current.

Hence, it is used for driving constant speed line shafts, lathes, constant speed head centrifugal pumps, fans, woodworking machines, milling machines etc.

Q.2. Which of the following statement is not true regarding KVL and KCL?

(a) Kirchhoff's Current Law states that the total current entering a junction or a node equals the charge leaving the node as no charge is lost.
(b) Kirchhoff's First Law is also known as Kirchhoff's Current Law.
(c) Kirchhoff's voltage law states that the voltage around a loop equals the sum of every voltage drop in the same loop for any closed network and equals zero.
(d) KCL is known as loop law.

Sol. **(d)**

KCL is known as loop law.

Q.3. If I_2 and I_1 are incoming current at a junction, where I_3 and I_4 are outgoing current at same junction then which of the following is correct?

(a) $I_1 + I_2 = I_3 + I_4$
(b) $I_1 + I_3 = I_2 + I_4$
(c) $I_1 + I_2 + I_3 = I_4$
(d) $I_1 = I_2 + I_3 + I_4$

Sol. **(a)**

Q.4. Lenz's law is bifurcated form of:

(a) conservation of energy
(b) conservation of mass
(c) conservation of linear momentum
(d) conservation of angular momentum

Sol. **(a)**

Q.5. Torque equation of PMMC

Sol. T = BINA

Q.6. Type of boiler used in thermal power plant.

Sol. Water tube boiler.

Q.7. Which one is incorrect regarding Sumpner test

Sol. This test is used to determine temperature rise, efficiency and voltage regulation. when the transformer is fully loaded. In this test, two identical transformers are taken, in which primary windings are connected in parallel whereas secondary windings are connected in series but in phase opposition.

Q.8. What is the ratio of reactive power and active power for pure resistive load?

Sol. Zero.

Q.9. There are 10 vertical lines and 8 horizontal lines, If horizontal signal frequency is 1000 Hz. Find vertical frequency.

Sol. $\frac{f_y}{f_x} = \frac{8}{10}$

$\frac{f_y}{1000} = \frac{8}{10}$

$f_y = \frac{8 \times 1000}{10}$

$f_y = 800 \text{ Hz}$

Q.10. Formula for diversity factor.

Sol. Diversity factor = Sum of Individual Max. Demand / Max. Demand

Q.11. What is rotor frequency?

Sol. Rotor frequency = s × supply frequency

Q.12. Demand factor is generally.

Sol. Demand factor is generally less than one.

Q.13. Air gap power.

Sol. Rotor copper loss = s × Air gap power

Q.14. Question on torque power relation.

Sol. $P = \frac{2\pi N}{60} T$

Q.15. In which motor starting torque is maximum?

Sol. DC series motor.

Q.16. What is efficiency under MPT?

Sol. 50%

Q.17. There are 3 loads i.e 100W, 200W, 300W and maximum demand 600W. Calculate demand factor.

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

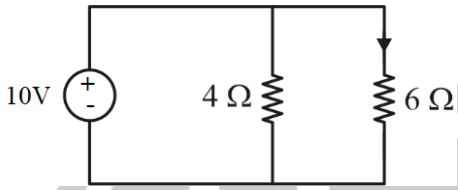
$$= \frac{600}{100+200+300} = 1$$

Q.18. Importance of SiO_2 layer in MOSFET.

Sol. The silicon dioxide forms the gate of the MOSFET that acts as a capacitor.

Q.19. What is the power absorbed by 6Ω resistor.

Sol.



$$P = \frac{V^2}{R} = \frac{10^2}{6} = \frac{100}{6} = 16.67W$$

Q.20. 1 ampere is equal to:

Sol. 1 ampere = 1000 mA.

Q.21. Inverse square law in utilization of electrical energy.

Sol. $I \propto \dfrac{1}{r^2}$

Q.22. What is formula of thermal power plant efficiency?

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

Q.23. Superposition theorem is not applicable for

Sol. Power calculations

Q.24. Which distribution system is more reliable?

Sol. Ring main distribution system is more reliable than other distribution systems.

Radial Distribution System:

- This system is used only when substation is located at the center of the consumers.
- In this system, different feeders radiate from a substation and feed the distributors at one end.

Ring main distribution system is the most preferred due to its following advantages:

- There are fewer voltage fluctuations at consumer's terminal.

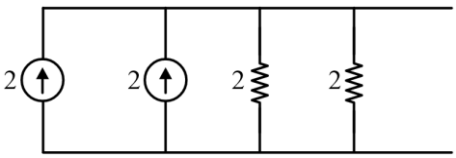
- The system is very reliable as each distribution transformer is fed with two feeders. That means, in the event of a fault in any section of the feeder, the continuity of the supply is ensured from the alternative path.

Q.25. What is use of damper winding in synchronous motor and generator?

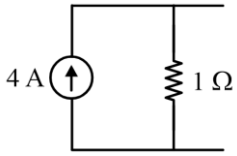
Sol. The damper winding in synchronous motor performs two functions:

- Prevents hunting (damped out oscillations)
- Provides starting torque (made self-starting)

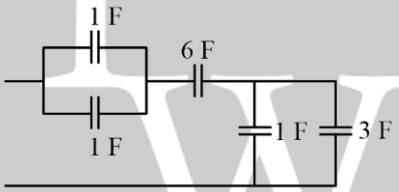
Q.26. Find Norton equivalent of given circuit.



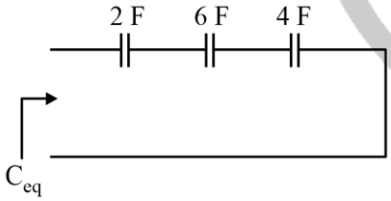
Sol.



Q.27. Find the equivalent capacitance in the given below circuit.



Sol.



$$\frac{1}{C_{eq}} = \frac{1}{2} + \frac{1}{6} + \frac{1}{4}$$

$$\frac{1}{C_{eq}} = \frac{6+2+3}{12}$$

$$C_{eq} = \frac{12}{11}$$

Q.28. Superposition theorem is applicable?

(a) to find current, voltage a power

(b) to find current & voltage in linear element R, L, C

(c) to find current voltage in diode, R, L, C

(d) all of above

Sol. Superposition theorem is applicable for linear network. Therefore supperposition applicable to find current & voltage in linear element R, L, C.

Q.29. The Ratio of change in voltage and change in current is equal to?

Sol. Dynamic Resistance/AC Resistance

Q.30. Widest Area of BJT Terminal is??

Sol. Collector

Q.31. The width of depletion Layer depends upon?

Sol. The width of depletion Layer depends upon doping concentration N_A, N_D.

$$w = \sqrt{\frac{2\varepsilon}{q}\left(\frac{1}{N_A}+\frac{1}{N_D}\right)(V_o + V_r)}$$

Q.32. What is the value of collector current for $\beta = 150$ and Base current = 30 μA?

Sol. $\beta = \frac{I_C}{I_B}$

$I_C = \beta I_B = 150 \times 30 \times 10^{-6} = 4.5\ mA$

Q.33. If temperature increases then PN Junction Barrier voltage will be?

Sol. If temperature increases then PN Junction Barrier voltage will Decrease.

Q.34. Built-in potential depends upon?

(a) Doping concentration
(b) Temperature
(c) Both doping concentration and temperature
(d) None of the above

Sol. Barrier potential depends upon doping Concentration & Temperature Both.

Q.35. When temperature increases then forward Bias current _____ & Reverse Bias current _____ be

Sol. When temperature increases then forward Bias current remains the same & Reverse Bias current increases.

Q.36. For voltage Source 'E' has internal Resistance 'R' then current at load for maximum power transfer will be

Sol. $\frac{E}{2R}$

Q.37. The filament used in incandescent lamp is made of :

Sol. Tungsten

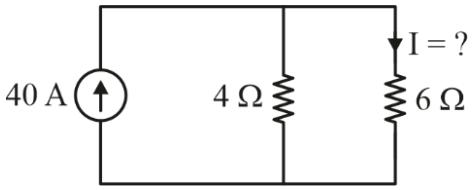
Q.38. Superposition theorem is applicable to

Sol. Linear & bilateral networks

Q.39. In MOSFET,SiO_2 layer is connected to which terminal?

Sol. Gate terminal

Q.40. What is the value of current I in the below circuit?.



Sol.

$$I = \frac{40 \times 4}{10} = 16A$$

SECTION B : NON-TECH

Q.1. Which article contains fundamental duties?
Sol. Article-51A, Part-IVA Suggested by swarna singh committee.

Q.2. 2-Disease due to vitamin-D deficiency
Sol. Loss of bone density osteoporosis. Severe deficiency may lead to rickets in children. In this boues becoumes soft and band. Also activation of tuberculosis.

Q.3. Which state recorded the highest decadal growth rate in population as per census - 2011
Sol. Dadra and Nagar Haveli.

Q.4. Which state has the highest population density as per census – 2011?
Sol. Bihar (1102 people per square kilometre)

Q.5. Which study is used for study of gas and liquid?
Sol. Fluid Physics.

Q.6. What is the maximum term of Lok Sabha?
Sol. 5 years but if national emergenct is in operation the life of lok sabha may be exteuded one year of a time for any length of time but when emergency ceases, this extension can not continue after 6 months.

Q.7. Who is the deputy CM of Maharashtra?
Sol. Ajit Pawar Nationalist Congress.

Q.8. Which articles deals with right to freedom?
Sol. Article 19 to 22

Q.9. Article – 112 deals with
Sol. Annual financial statement.

Q.10. Hari Prasad Chorasiya belong to
Sol. Classical flautist.

Q.11. What is minimum age of qualification for vice president
Sol. 35 years.

Q.12. Pramila Malik has been appointed as the first female speaker of
Sol. Odisha.

Q.13. GST bill was posted to
Sol. Simplify taxation and increase tax liability.

Q.14. NDRF full form
Sol. National Disaster Response Force.

Q.15. Rourkela plant
Sol. 1959 by help of Germany in odisha

Q.16. Cytoskeleton
Sol. Stracfore of cell.

Q.17. AP Governor
Sol. S. Abdul Nazeer.

Q.18. 1 amp to milliampere
Sol. 1 A = 1000 mA.

Q.19. Caustic soda formula
Sol. NaOH, Sodium Hydroxide.

Q.20. Chloroform formula
Sol. $CHCl_3$

Q.21. Maximum storage
Sol. Cloud storage.

Q.22. 4th schedule of the constitution
Sol. Allocation of seats in Rajya Sabha.

Q.23. Which article deals with powers of president?
Sol. Article-53.