10/CME/M–2025-10

Booklet Series

E

Question Booklet

ELECTRICAL ENGINEERING

Paper – VI

Booklet Serial No.

2720213

Candidate's Roll Number

Time Allowed : 01 Hour

Maximum Marks : 100

Read the following instructions carefully before you begin to answer the questions.

IMPORTANT INSTRUCTIONS

1. This Question Booklet contains **50** questions in all.
2. **All** questions carry equal marks.
3. Attempt **all** questions.
4. An Answer Sheet has been supplied inside the question booklet to mark the answers. **You must write your Roll Number and encode it and write other particulars in the space provided in the Answer Sheet, failing which your Answer Sheet will not be evaluated.**
5. **Immediately after commencement of the examination, you should check up your Question Booklet and attached answer sheet and ensure that the Question Booklet Series is printed on the top left-hand corner of the Booklet and the series encoded in answer sheet are same. Also please check that the Booklet contains 12 printed pages including two pages (Page Nos. 11 and 12) for Rough Work and no page or question is missing or unprinted or torn or repeated or question booklet and answer sheet have different series. If you find any defect in this Booklet and attached answer sheet, get it replaced immediately by a complete Booklet with OMR sheet of the same series.**
6. You must write your Roll Number in the space provided on the top of this page. Do not write anything else on the Question Booklet.
7. Questions and their responses are printed in English version in this Booklet. Each question comprises of **four** responses — (A), (B), (C) and (D). You are to select ONLY ONE correct response and mark it in your Answer Sheet. In case you feel that there are more than one correct response, mark the response which you consider the best. In any case, choose ONLY ONE response for each question. Your total marks will depend on the number of correct responses marked by you in the Answer Sheet.
8. In the Answer Sheet, there are **four** circles — Ⓐ, Ⓑ, Ⓒ and Ⓓ against each question. To answer the questions, you are to mark with **Black/Blue ink ballpoint pen ONLY ONE circle** of your choice for each question. Select only one response for each question and mark it in your Answer Sheet. If you mark more than one circle for one question, the answer will be treated as wrong. **Use Black/Blue ink ballpoint pen only to mark the answer in the Answer Sheet. Any erasure or change is not allowed.**
9. You should not remove or tear off any sheet from the Question Booklet. You are not allowed to take this Question Booklet and the Answer Sheet out of the Examination Hall during the examination. **After the examination has concluded, you must hand over your Answer Sheet to the Invigilator**. Thereafter, you are permitted to take away the Question Booklet with you.
10. Failure to comply with any of the above instructions will render you liable to such action or penalty as the Commission may decide at their discretion.
11. Candidates must assure before leaving the Examination Hall that their Answer Sheets will be kept in Self Adhesive LDPE Bag and completely packed/sealed in their presence.

1. Load flow study is carried out for

(A) System planning

(B) Stability studies

(C) Fault calculations

(D) Load frequency control

2. How many don't-care inputs are there in a BCD adder ?

(A) 213

(B) 321

(C) 312

(D) 231

3. The largest ultra mega solar power plant in India and Asia's largest single site solar power plant is located in the following place

(A) Jamnagar (Gujarat)

(B) Bodhgaya (Bihar)

(C) Rewa (MP)

(D) Bengaluru (Karnataka)

4. The centre of the constant phase angles loci (N – circles) is

(A) $x = -\frac{1}{2}, y = \frac{1}{2N}$

(B) $x = \frac{1}{2}, y = \frac{1}{2N}$

(C) $x = \frac{1}{2}, y = -\frac{1}{2N}$

(D) $x = -\frac{1}{2}, y = -\frac{1}{2N}$

5. The stator of a 3-phase, 4-pole wound rotor induction motor is connected to 50 Hz source, but its rotor is energised from 20 Hz source. The two possible no-load speeds of the motor are

(A) 1500 rpm and 2100 rpm

(B) 600 rpm and 2100 rpm

(C) 600 rpm and 900 rpm

(D) 1500 rpm and 600 rpm

6. The maximum distance upto which TV transmission from a TV tower of height h can be received is proportional to

(A) $h^{3/2}$

(B) h

(C) $h^{1/2}$

(D) $h^{2/3}$

7. Power transmission line in electrical power systems are transposed to reduce

(A) Skin effect

(B) Interference with neighbouring communication lines

(C) Proximity effect

(D) Ferranti effect

8. The characteristic equation of a control system is given below.

$s^6 + s^5 + 5s^4 + 3s^3 + 2s^2 - 4s - 8 = 0$

The system has the following roots with positive real part

(A) 2

(B) 3

(C) 0

(D) 1

9. Hard disk in a computer is

(A) High capacity optical disk storage

(B) High capacity CDROM

(C) Permanent magnetic storage

(D) Temporary magnetic storage

10. A 3-phase, 50 Hz induction motor has a full load speed of 1440 rpm. For this motor, the number of poles are

(A) 6

(B) 4

(C) 5

(D) 4.1666

11. The magnitude of the small signal current gain for a common drain amplifier for an ideal MOSFET biased in saturation is

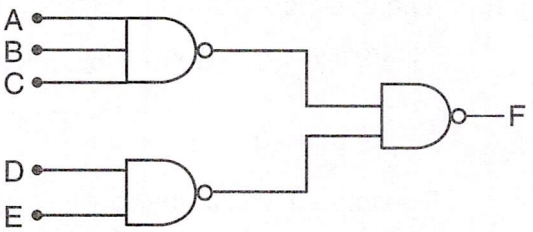
(A) 1

(B) Infinite

(C) 100

(D) Zero

12. The output function F of the following gate circuit is



(A) $F = ABC + DE$

(B) $F = ABC + \overline{DE}$

(C) $F = \overline{ABC} + DE$

(D) $F = \overline{ABC} + \overline{DE}$

13. Which one of the following is the main advantage of an autotransformer ?

(A) Saving in winding material

(B) Reduction in eddy current losses

(C) Negligible copper losses

(D) Reduction in hysteresis losses

14. The heights of the transmitting and receiving antennas are 33.8 m and 64.8 m respectively. The maximum distance between the antennas for satisfactory communication in line of sight mode considering radius of the earth = 6400 km is

(A) 39.8 km

(B) 49.6 km

(C) 59.2 km

(D) 29.4 km

15. The open loop transfer function of a control system is given below

$$G(s)\,H(s) = \frac{K}{s(s+4)(s^2+4s+13)}$$

The intersection of the root locus plot with the imaginary axis is

(A) $\pm j\,2.07$

(B) $\pm j\,1.52$

(C) $\pm j\,2.56$

(D) $\pm j\,1.78$

16. The simplified form of the following Boolean function is

$F(W, X, Y, Z) = \Sigma(0, 1, 2, 4, 5, 6, 8, 9, 12, 13, 14)$

(A) $F = \overline{X} + \overline{X}\,\overline{Y} + W\overline{X}$

(B) $F = \overline{Y} + \overline{W}\,\overline{Z} + X\overline{Z}$

(C) $F = \overline{Z} + \overline{Y}\,\overline{Z} + Y\overline{W}$

(D) $F = \overline{W} + \overline{Y}\overline{Z} + Y\overline{Z}$

17. A transmission line has 0.2 PU impedance on a base of 132 kV, 100 MVA. On a base of 220 kV, 50 MVA, it will have a PU impedance of

(A) $0.2 \times \frac{100}{50} \times \left(\frac{132}{220}\right)^2$

(B) $0.2 \times \frac{50}{100} \times \left(\frac{132}{220}\right)^2$

(C) $0.2 \times \frac{100}{50} \times \left(\frac{220}{132}\right)^2$

(D) $0.2 \times \frac{50}{100} \times \left(\frac{220}{132}\right)^2$

18. The radius of the constant magnitude loci (M – circles) is

(A) $\frac{M^2}{(1-M^2)}$

(B) $\frac{M}{(1+M^2)}$

(C) $\frac{M^2}{(1+M^2)}$

(D) $\frac{M}{(1-M^2)}$

19. For a lumped inductive load, with increase in the supply frequency

(A) P increases, Q decreases

(B) P decreases, Q increases

(C) P and Q decreases

(D) P and Q increases

20. A push-pull amplifier is used for

(A) Power amplification

(B) Current amplification

(C) RF signal amplification

(D) Voltage amplification

21. A 500 KVA transformer has an efficiency of 95% at full load and also at 60% of full load, both at unity power factor. The efficiency of the transformer at 75% of the full load is

(A) 95.14%

(B) 99.95%

(C) 98.57%

(D) 96.58%

22. Web pages are written using

(A) URL

(B) HTTP

(C) FTP

(D) HTML

23. A 100 MVA synchronous generator operates on full load at a frequency of 50 Hz. The load is suddenly reduced to 50 MW. Due to time lag in governor system, the steam valve begins to close after 0.4 sec. For H = 5 kWS/KVA of generation capacity, the change in frequency that occurs in this time is

(A) 50 Hz

(B) 51 Hz

(C) 49.85 Hz

(D) 49 Hz

24. A DC shunt generator driven by a belt from an engine runs at 750 rpm while feeding 100 kW of electric power into 230 V mains. When the belt breaks it continues to run as a motor drawing 9 kW from the mains. The armature resistance is 0.08 Ω and field resistance is 115 Ω. The speed of the generator in motoring mode is

(A) 650 rpm

(B) 750 rpm

(C) 642.7 rpm

(D) 742.7 rpm

25. The output voltage of a voltage amplifier is found to decrease by 20% when a load resistance of 1 KΩ is connected. The output resistance of the amplifier is

(A) 2500 Ω

(B) 1250 Ω

(C) 250 Ω

(D) 5000 Ω

26. A conductor is composed of seven identical copper strands, each having a radius r. The self GMD of the conductor is

(A) 2.177 r

(B) 3.177 r

(C) 0.707 r

(D) 1.177 r

27. The value of K such that the roots of the characteristic equation given below lie to the left of line s = –1 is

$s^3 + 10s^2 + 18s + K = 0$

(A) Between 7 and 16

(B) Between 9 and 16

(C) Between 10 and 18

(D) Between 7 and 9

28. Surge impedance of 400 Ω means

(A) Open circuit impedance of 400 Ω

(B) Line can be practically loaded upto 400 Ω

(C) Line can be theoretically loaded upto 400 Ω

(D) Short circuit impedance of 400 Ω

29. The open loop transfer function of a unity feedback control system is given by

$$G(s) = \frac{2s}{s(s+6)}$$

The damping ratio of control system is

(A) 5

(B) 6

(C) 0.6

(D) 0.9

30. The emf per turn for a single phase, 2310/220 V, 50 Hz transformer is approximately 13 V. The number of primary and secondary turns are

(A) 16 and 168

(B) 18 and 187

(C) 17 and 169

(D) 17 and 179

31. The negative feedback in an amplifier leads to which one of the following ?

(A) Decrease in voltage gain

(B) Increase in current gain

(C) Decrease in bandwidth

(D) Increase in voltage gain

32. The southern grid was synchronously interconnected to the central grid for establishment of the national grid on 31 December 2013 with the commissioning of the 765 kV transmission line. The name of this high voltage transmission line is

(A) Kalpakkam – Rameshwaram transmission line

(B) Koodankulam – Ananthpur transmission line

(C) Tarapur – Kolhapur transmission line

(D) Raichur – Solapur transmission line

33. A 3-phase induction motor has a starting torque of 150% and a maximum torque of 250% of the full load torque. Neglect stator resistance and assume constant rotor resistance. The slip at maximum torque is

(A) 0.333

(B) 1

(C) 0.222

(D) 0.111

34. What does the symbol parallelogram signify in flow chart ?

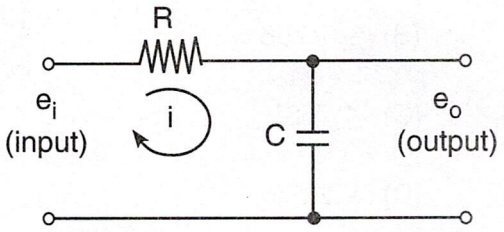
(A) Represents a process or operation step

(B) Represents input and output operations

(C) Represents mathematical interpretation

(D) Represents start or end of a process

35. The transfer function of the following network is



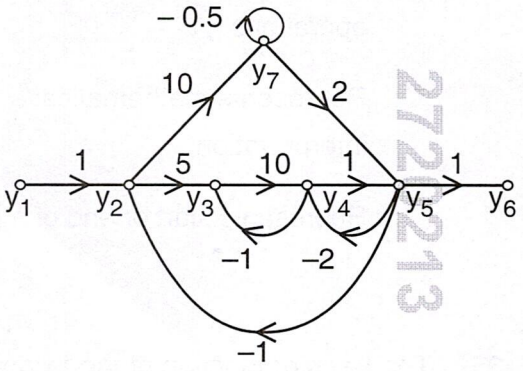
(A) $\frac{E_o(s)}{E_i(s)} = \frac{1}{CS+R}$

(B) $\frac{E_o(s)}{E_i(s)} = \frac{R}{RCS+1}$

(C) $\frac{E_o(s)}{E_i(s)} = \frac{1}{RCS+1}$

(D) $\frac{E_o(s)}{E_i(s)} = \frac{1}{RCS-1}$

36. The signal flow graph of a control system is shown below. The transfer function of the system is



(A) 2.576

(B) – 1.758

(C) 1.758

(D) – 2.576

37. In a certain JFET has an I_{GSS} of – 2 nA for V_{GS} = – 20 V. The input resistance is

(A) 1000 MΩ

(B) 1000 KΩ

(C) 10000 KΩ

(D) 10000 MΩ

38. The open loop transfer function of a unity feedback control system is given below

$$G(s) = \frac{K}{s(s+1)(s+3)}$$

The breakaway point of the root locus is

(A) – 0.45

(B) 2.25

(C) – 2.25

(D) 0.45

39. C language in computers is

(A) A third generations high level language

(B) An assembly language

(C) A translation language

(D) A machine language

40. The total core loss of a transformer core is found to be 1500 W at 50 Hz. Keeping the flux density constant the loss becomes 3000 W. When the frequency is raised to 75 Hz, the eddy current loss at 50 Hz is

(A) 500 W

(B) 750 W

(C) 2250 W

(D) 1000 W

41. The carrier of an AM signal has power of 1000 W. If the percentage of modulation is 80, the total sideband power is

(A) 320 W

(B) 640 W

(C) 480 W

(D) 160 W

42. What size ROM would it take to implement a BCD adder/subtractor with a control input to select between the addition and subtraction ?

(A) 1024×3

(B) 1024×5

(C) 1024×4

(D) 1024×2

43. The method of images originally suggested by Lord Kelvin is used in

(A) Calculation of resistance

(B) Effect of earth on line capacitance

(C) Ferranti effect

(D) Calculation of inductance

44. The simplified form of the Boolean function $F = \overline{A}\overline{B}\overline{C} + \overline{B}C\overline{D} + \overline{A}BC\overline{D} + A\overline{B}\overline{C}$ is

(A) $F = \overline{A}\overline{B} + \overline{B}C + \overline{A}B\overline{C}$

(B) $F = A\overline{B} + \overline{A}\overline{C} + A\overline{B}\overline{C}$

(C) $F = \overline{A}B + \overline{B}\overline{C} + A\overline{C}\overline{D}$

(D) $F = \overline{B}\overline{D} + \overline{B}\overline{C} + \overline{A}C\overline{D}$

45. The initial slope of the asymptotic Bode plot for the following transfer function is

$$G(s)\,H(s) = \frac{2(s+0.25)}{s^2(s+1)(s+0.5)}$$

(A) – 20 db/decade

(B) – 40 db/decade

(C) 40 db/decade

(D) – 10 db/decade

46. The following data were obtained on a 20 KVA, 50 Hz, 2000/200 V distribution transformer. The resistance of the approximate equivalent circuit of the transformer referred to the LV side is

Test	Voltage (V)	Current (A)	Power (W)
OC test	200	4	120
SC test	60	10	300

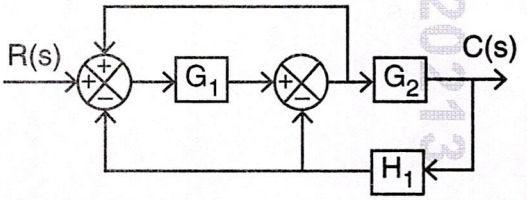
(A) 3 Ω

(B) 0.3 Ω

(C) 0.03 Ω

(D) 0.003 Ω

47. The $\frac{C(s)}{R(s)}$ of the following control system using block diagram reduction method is



(A) $\frac{C(s)}{R(s)} = \frac{G_1 G_2}{1 - G_1 H_1 + G_1 G_2 H_1 - G_1}$

(B) $\frac{C(s)}{R(s)} = \frac{G_1 G_2}{1 + G_2 H_1 + G_1 G_2 H_1 + G_1}$

(C) $\frac{C(s)}{R(s)} = \frac{G_1 G_2}{1 + G_2 H_1 - G_1 H_1 + G_1 G_2 H_1}$

(D) $\frac{C(s)}{R(s)} = \frac{G_1 G_2}{1 + G_2 H_1 + G_1 G_2 H_1 - G_1}$

48. A 330 MW combined cycle gas turbine power project was set up on fast track basis at New Delhi. What is the name of the power plant ?

(A) Pragati power plant

(B) Aatmanirbhar power plant

(C) Make in India power plant

(D) Swadeshi power plant

49. The coupling capacitor of a multi-stage R-C coupled amplifier

(A) Limits the low frequency response

(B) Limits the high frequency response

(C) Reduces the amplitude of input signal

(D) Blocks DC component without affecting the frequency response

50. A 4-pole synchronous generator driven at 1500 rpm feeds a 6-pole induction motor which is loaded to run at a slip of 5%. The motor speed is

(A) 900 rpm

(B) 950 rpm

(C) 1000 rpm

(D) 1500 rpm

SPACE FOR ROUGH WORK