

Ph. D. Entrance Test – 2015**Subject: Electrical and Electronics Engineering
Paper – I**

Important: Please consult your Admit Card/Roll No. slip before filling your Roll Number on the Test Booklet and Answer Sheet.

Roll No. *In Figure* *In Words*

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O.M.R. Answer Sheet Serial No.

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Signature of Candidate: _____ Signature of Invigilator: _____

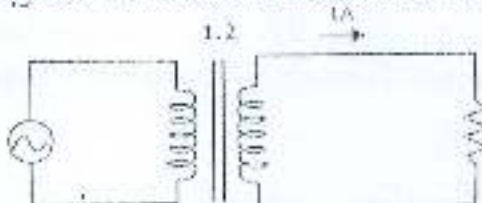
Time: 60 Minutes Number of Questions: 50 Maximum Marks: 50

DO NOT OPEN THE SEAL ON THE BOOKLET UNTIL ASKED TO DO SO.

INSTRUCTIONS:

1. Write your Roll No. on the Questions Booklet and also on the OMR Answer Sheet in the space provided and nowhere else.
2. Enter the Question Booklet Serial No. on the OMR Answer Sheet. Darken the corresponding bubbles with **Black Ball Point/Black Gel Pen**.
3. Do not make any identification mark on the Answer Sheet or Question Booklet.
4. Please check that this Question Booklet contains **50** Questions. In case of any discrepancy, inform the Assistant Superintendent within 10 minutes of the start of Test.
5. Each question has four alternative answer (A,B,C,D) of which only one is correct. For each question, darken only one bubble (A or B or C or D), whichever you think is the correct answer, on the Answer Sheet with **Black Ball Point/Black Gel Pen**. **There shall be no negative marking for wrong answers.**
6. If you do not want to answer a question, leave all the bubbles corresponding to that question blank in the Answer Booklet. No marks will be deducted in such cases.
7. Darken the bubbles in the OMR Answer Sheet according to the Serial No. of the question given in the Question Booklet.
8. If you want to change an already marked answer, erase the shade in the darkened bubble completely.
9. For rough work only the blank sheet at the end of the Question Booklet be used.
10. The Answer Sheet is designed for computer evaluation. Therefore, if you do not follow the instructions given on the Answer Sheet, it may make evaluation by the computer difficult. **Any resultant loss to the candidate on the above account, i.e. not following the instructions completely, shall be of the candidate only.**
11. After the test, hand over the Question Booklet and the Answer Sheet to the Assistant Superintendent on duty.
12. In no case the Answer Sheet, the Question Booklet, or its part or any material copied/noted from this Booklet is to be taken out of the examination hall. Any candidate found doing so would be expelled from the examination.
13. A candidate who creates disturbance of any kind or changes his/her seat or is found in possession of any paper possibly of any assistant or found giving or receiving assistant or found using any other unfair means during the examination will be expelled from the examination by the Centre Superintendent/Observer whose decision shall be final.
14. **Communication equipment such as mobile phones, pager, wireless set, scanner, camera or any electronic/digital gadget etc., is not permitted inside the examination hall. Use of calculators is not allowed.**
15. The candidates will not be allowed to leave the Examination Hall/Room before the expiry of the allotted time.

- For enhancing the power transmission along EHV transmission line, the most preferred method is to connect a
 - Series inductive compensator in the line
 - Shunt inductive compensator at the receiving end
 - Series capacitive compensator in the line
 - Shunt capacitive compensator at the sending end
- A 220 V dc machine has an armature resistance of 1 ohm. If the full load current is 20A, the difference in the induced voltage when the machine is running as a motor, and as a generator is
 - 20 V
 - zero
 - 40 V
 - 50 V
- In power station practice "spinning reserve" is
 - Reserve generating capacity that is in operation but not in service.
 - Reserve generation capacity that is connected to bus and ready to take the load.
 - Reserve generating capacity that is available for service but not in operation.
 - Capacity of the part of the plant that remains under maintenance.
- A negative sequence relay is commonly used to protect
 - an alternator
 - an transformer
 - a transmission line.
 - a bus bar
- A 3-phase step down transformer is connected to 6.6 kV mains and takes 10A. For which of the following connection the secondary line current will be least?
 - Delta - Delta
 - Star - Star
 - Delta - Star
 - Star - Delta
- A single-phase transformer has a turn ratio of 1:2, and is connected to a purely resistive load as shown in the figure. The magnetizing current drawn is 1A, and the secondary current is 1A. If core losses and leakage reactance's are neglected, the primary current is
 - 2.24 A
 - 2 A
 - 1.41 A
 - 3 A

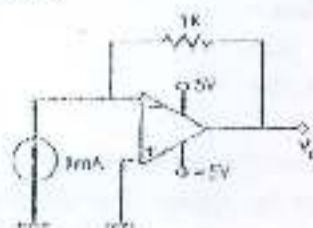


- The A, B, C, D constants of a 220 kV line are $A=D=0.94\angle 1^\circ$, $B=130\angle 73^\circ$, $C=0.001\angle 90^\circ$. If the sending end voltage of the line for a given load delivered at nominal voltage is 240kV, then percentage voltage regulation of the line is
 - 5
 - 9
 - 16
 - 21

8. The corona loss on a particular system at 50 Hz is 1kW/km per phase. The corona loss at 60 Hz would be
 (A) 1 kW/km per phase
 (B) 0.83 kW/km per phase
 (C) 1.2 kW/km per phase
 (D) 1.13 kW/km per phase
9. The characteristics equation of a feedback control system is $2s^4 + s^3 + 3s^2 + 5s + 10 = 0$. The numbers of roots in the right half of s-plane are
 (A) 0
 (B) 1
 (C) 2
 (D) 3
10. The severity of L-G and 3 Φ faults at the terminals of an unloaded synchronous generator is to be same. If the terminal voltage is 1.0 p.u. and $Z_1 = Z_2 = j0.1$ p.u., $Z_0 = j0.05$ p.u. for an alternator, then the required inductive reactance for neutral grounding in p.u. is
 (A) 0.0166
 (B) 0.05
 (C) 0.1
 (D) 0.15
11. A 800 kV transmission line is having per phase line inductance of 1.1 mH/km and per phase capacitance of 11.98nF/km. Ignoring the length of line, the power transfer capability in MW is
 (A) 1204 MW
 (B) 2085 MW
 (C) 1504 MW
 (D) 2606 MW

12. The circuit shown in figure uses an ideal Op-Amp working with +5V and -5V power supplies. The output voltage V_o is equal to

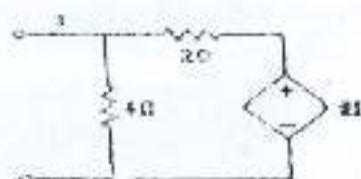
- (A) +5 V
 (B) -5 V
 (C) +1 V
 (D) -1 V



13. A voltage waveform $V(t) = 12t^2$ is applied across a 1H inductor for $t \geq 0$, with initial current through it being zero. The current through the inductor for $t \geq 0$ is given by
 (A) $12t$
 (B) $24t$
 (C) $12t^3$
 (D) $4t^3$

14. The circuit shown is equivalent to load of

- (A) $4/3 \Omega$
 (B) $8/3 \Omega$
 (C) 4Ω
 (D) 8Ω



15. The resistance and reactance of a 100 kVA 11kV/400 V, Δ -Y distribution transformer are 0.02 and 0.07 p.u. respectively. The phase impedance of the transformer referred to the primary is
 (A) $(0.02 + j0.07) \Omega$ (B) $(0.55 + j1.925) \Omega$
 (C) $(15.125 + j52.78) \Omega$ (D) $(72.6 + j254.1) \Omega$
16. Power plant having maximum demand more than the installed rated capacity will have utilization factor
 (A) equal to unity (B) less than unity
 (C) more than unity (D) none of the above
17. Addition of zeros in transfer function causes which of the following?
 (A) Lead compensation (B) Lead-lag
 (C) Lag-compensation (D) Lead-Lead Compensation
18. A DC A-h meter is rated for 15 A, 250 V. The meter constant is 14.4 A-sec/rev. The meter constant at rated voltage may be expressed as
 (A) 1000 rev/kWh (B) 3750 rev/kWh
 (C) 3600 rev/kWh (D) 960 rev/kWh
19. In squirrel cage induction motors, the rotor slots are usually given slight skew in order to
 (A) Reduce windage losses
 (B) Reduce eddy currents
 (C) Reduce accumulation of dirt and dust
 (D) Reduce magnetic hum
20. A synchronous condenser is virtually which of the following?
 (A) Induction motor (B) Under excited synchronous motor
 (C) Over excited synchronous motor (D) D.C. generator
21. The minimal product-of-sum function described by K-map for the following table is

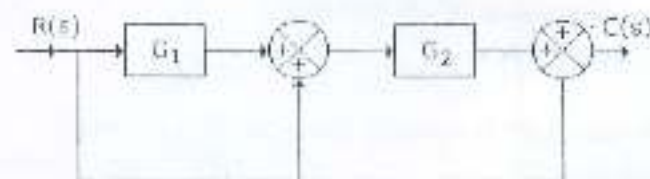
	AB			
C	00	01	11	10
0	1	1	ϕ	0
1	0	0	ϕ	0

given by

- (A) $A' + C$ (B) $A \cdot C$
 (C) $A + C$ (D) AC
22. For a given base voltage and base volt-amperes the per unit impedance value of an element is X. What will be per unit impedance value of this element when the voltage and volt-amperes bases are both doubled?
 (A) $X/2$ (B) $2X$
 (C) $4X$ (D) X
23. The plug setting multiplier of a negative sequence relay is 0.2 A. The current transformer ratio is 5:1. The minimum value of the line-to-line fault current for the operation of the relay is
 (A) 1 A (B) $\frac{1}{\sqrt{3}}$ A
 (C) $\sqrt{3}$ A (D) $\frac{0.2}{\sqrt{3}}$ A

24. For equilateral spacing of conductors of an untransposed 3-phase line, we have
 (A) Balanced receiving end voltage and communication interference
 (B) Unbalanced receiving end voltage and no communication interference
 (C) Balanced receiving end voltage and no communication interference
 (D) Unbalanced receiving end voltage and communication interference
25. A 100 km long transmission line is loaded at 110 kV. If the loss of line is 5 MW and the load is 150 MVA, the resistance of the line is
 (A) 8.06 ohms per phase
 (B) 0.806 ohms per phase
 (C) 0.0806 ohms per phase
 (D) 80.6 ohms per phase
26. When bundle conductors are used in place of single conductors, the effective inductance and capacitance will respectively
 (A) increase and decrease
 (B) decrease and increase
 (C) Decrease and remain unaffected
 (D) remains unaffected and increase
27. The technique which gives quick transient and stability response is
 (A) Root Locus
 (B) Bode Plot
 (C) Nyquist Plot
 (D) Nichols Chart

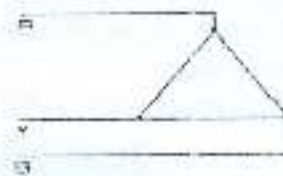
28. For the system in the given figure. The transfer function $C(s)/R(s)$ is



- (A) $G_1 + G_2 + 1$
 (B) $G_1 G_2 + G_2 + 1$
 (C) $G_1 G_2 + 1$
 (D) $G_1 G_2 + G_1 + 1$
29. PID controlled system has
 (A) P and I actions in forward path and D action in feedback path
 (B) P and I actions in feedback path and actions in forward path
 (C) All the three (i.e., P, I and D) actions in forward path
 (D) All the three (i.e., P, I and D) actions in feedback path
30. The effect of negative feedback on distortion and bandwidth is
 (A) both are decreased
 (B) distortion is reduced and bandwidth is increased
 (C) both are increased
 (D) distortion is increased and bandwidth is decreased
31. A Single phase diode bridge rectifier supplies a highly inductive load. The load current can be assumed to be ripple free. The ac supply side current waveform will be
 (A) Sinusoidal
 (B) Constant DC
 (C) Square
 (D) Triangular
32. The main criterion for the selection of size of a distribution for a radial distribution system is
 (A) Voltage drop
 (B) Corons loss
 (C) Temperature rise
 (D) Capital cost

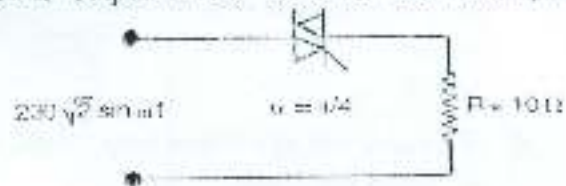
33. The phase sequence of the following 3-phase system shown in figure below is

- (A) RYB
- (B) RBY
- (C) YBR
- (D) BRY



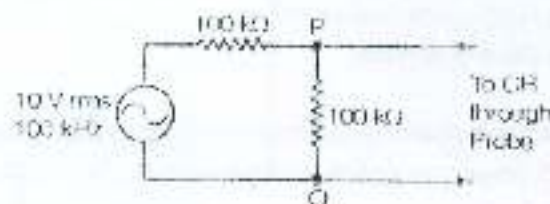
34. The TRIAC circuit controls the ac power output to the resistive load. The power dissipation in the load is

- (A) 3968 W
- (B) 5290 W
- (C) 7935 W
- (D) 10580 W



35. A CRO probe has an impedance of 500kΩ in parallel with a capacitance of 10 pF. The probe is used to measure the voltage between P and Q as shown in circuit below. The measured voltage will be

- (A) 3.53 V
- (B) 4.37 V
- (C) 4.54 V
- (D) 5 V



36. For Y_{BUS} of a 4-bus system given in per unit, the buses having shunt elements are

$$Y_{BUS} = j \begin{bmatrix} -5 & 2 & 2.5 & 0 \\ 2 & -10 & 2.5 & 4 \\ 2.5 & 2.5 & -9 & 4 \\ 0 & 4 & 4 & -3 \end{bmatrix}$$

- (A) 3 and 4
- (B) 1 and 2
- (C) 1, 2 and 4
- (D) 2 and 3

37. The DC motor which can provide zero speed regulation at full load without controller is

- (A) Series
- (B) Cumulative Compound
- (C) Differential Compound
- (D) Shunt

38. A 100:5 current transformer has secondary winding and lead resistance of 0.20 ohm and secondary burden is 5 VA. The VA output is

- (A) 5 VA
- (B) 10 VA
- (C) 7.5 VA
- (D) 2.5 VA

39. For a 10-bus power system with 2 voltage controlled buses, the size of the Jacobian matrix is

- (A) 10 x 10
- (B) 8 x 8
- (C) 18 x 18
- (D) 16 x 16

40. In case of HVDC system, there is

- (A) charging current but no skin effect
- (B) no charging current but no skin effect
- (C) neither charging current but no skin effect
- (D) both charging current but no skin effect

41. While measuring power in three-phase load by two wattmeter method, the readings of two watt meters will be equal and opposite when
 (A) Power factor is unity (B) Load is balanced
 (C) Phase angle is between 60° to 90° (D) The load is purely inductive
42. An ac supply is connected through a diode to a pure inductance. What is the angle for which this diode conducts?
 (A) 90° (B) 360°
 (C) 270° (D) 180°
43. If the root loci of a closed loop system do not cross the imaginary axis, the system is
 (A) Inherently Stable (B) Unstable
 (C) Marginally Stable (D) critically unstable
44. A separately-excited DC motor is required to be controlled from a 3-phase supply for two quadrant operation. The most suitable converter would be
 (A) Half-controlled rectifier (B) Fully-controlled rectifier
 (C) Dual Converter (D) Semi-converter
45. In a three phase Delta/Star transformer, the phase displacement of secondary line voltage with respect to corresponding primary line voltages is
 (A) Zero (B) 30° lag
 (C) 30° lead (D) 180°
46. An auto transformer having a transformation ratio of 0.5, supplies a load of 20 kW. The power transferred inductively from primary to secondary
 (A) 10 kW (B) 10.5 kW
 (C) 5 kW (D) 20 kW
47. The inverse Laplace transform of $\frac{3}{s^2 - 8s + 20}$ is
 (A) $\frac{e^{2t}}{2} \sin 2t$
 (B) $\frac{e^{4t}}{2} \sin 2t$
 (C) $e^{4t} \sin 2t$
 (D) $e^{4t} \sin 4t$
48. Octal equivalent of the HEX number ABCD is
 (A) 253.314
 (B) 526.632
 (C) 526.314
 (D) 253.632
49. Induction generator works when the slip is
 (A) Negative
 (B) Between 1 and 2
 (C) $0.1 < S < 1.0$
 (D) Positive
50. The percentage efficiency of a circuit at maximum power transfer condition is
 (A) 100 (B) 75
 (C) 50 (D) 66.6