

M.Tech. Entrance Test – 2013 (AKU, Patna)

Subject: Electrical Engineering

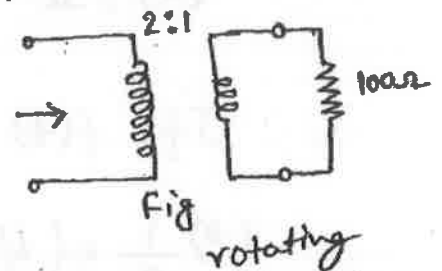
Time: - 1½ Hrs.

Full marks: 50

INSTRUCTIONS: -There are four options given for a question. You have choose the correct option/s. Candidates are required to submit this Question paper with answer book.

1. In the ideal transformer (IT) shown in figure, the resistance seen from the HV side is :

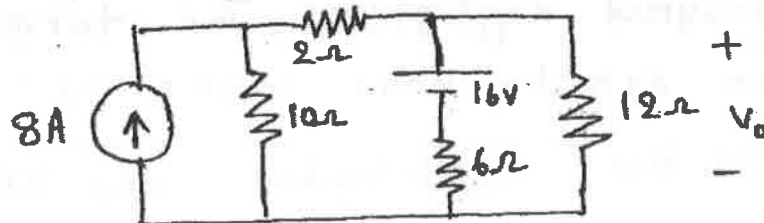
- (a) $25\ \Omega$ (b) $50\ \Omega$
(c) $100\ \Omega$ (d) $400\ \Omega$



2. Maximum power output is given by an ^{rotating} Machine at an efficiency of :

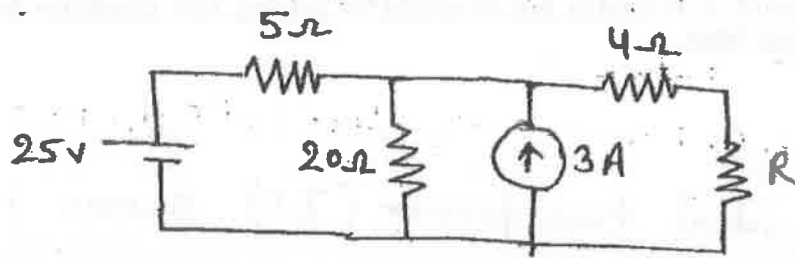
- (a) 10% (b) 50% (c) 25% (d) 90%

3. The voltage V_0 in figure is:



- (a) 48V (b) 24V (c) 36V (d) 28V

4. The value of R required for maximum power transfer in the network shown in figure is:



- (a) 2Ω (b) 4Ω (c) 8Ω (d) 16Ω

5. If $f(t) * g(t) = c(t)$ then $f(at) * g(at) =$

- (a) $\frac{1}{a} c(t/a)$ (b) $\frac{1}{a} c(at)$ (c) $-\frac{1}{a} c(at)$ (d) $\left|\frac{1}{a}\right| c(at)$

6. The power input to an induction motor is 40 kW when it is running at 5% slip. The stator resistance and core loss are assumed negligible. The torque developed in synchronous watts is:

- (a) 42 kW (b) 40 kW (c) 38 kW (d) 2 kW

7. Compared to a Capacitor-start motor a two-value capacitor motor has:

(a) Nearly the same starting torque but better

running power factor

(b) ~~Higher~~ Higher starting and higher running power factor

(c) Higher starting torque but lower running power factor

(d) None of these

8. Pulsation-loss in rotating machines occurs in:

(a) Pole body

(b) Pole shoes

(c) Yoke

(d) Stator & Rotor cores

9. If a periodic signal has odd symmetry then the Fourier series:

(a) only sine terms

(b) only cosine terms

(c) Both sine and cosine terms

(d) None

10. The Fourier transform for a signal $x(t)$ exists when

(a) $\int_{-\infty}^{\infty} f(t) dt = \infty$

(b) $\int_{-\infty}^{\infty} f(t) dt < \infty$

(c) $\int_{-\infty}^{\infty} |f(t)| dt = \infty$

(d) $\int_{-\infty}^{\infty} f(t) dt > \infty$

11. Three identical resistances are connected in Star carry a line current of 12A. If the same resistances are connected in delta across the same supply, the line current will be

- (a) 12 A (b) 4 A (c) 8 A (d) 36 A

12. A two-port network K is symmetrical if:

- (a) $Z_{11} Z_{22} - Z_{12} Z_{21} = 1$ (b) $AD - BC = 1$
 (c) $h_{11} h_{22} - h_{12} h_{21} = 1$ (d) $Y_{11} Y_{22} - Y_{12} Y_{21} = 1$

13. If stator impedance is neglected, the maximum torque in an induction motor occurs at a rotor resistance of:

- (a) $(1+s)x_2$ (b) $(1-s)x_2$ (c) sx_2 (d) x_2

14. The Laplace transform of a continuous-time signal is $X(s) = \frac{5-s}{s^2-s-2}$. If the Fourier transform of this signal exists, then $x(t)$ is:

- (a) $e^{2t} u(t) - 2e^{-t} u(t)$ (b) $-e^{2t} u(-t) + 2e^{-t} u(t)$
 (c) $-e^{2t} u(-t) - 2e^{-t} u(t)$ (d) $e^{2t} u(-t) - 2e^{-t} u(t)$

15. The power in a series R-L-C circuit will be half of that at resonance when the magnitude of current is equal to:

- (a) $\frac{V}{2R}$ (b) $\frac{V}{\sqrt{3}R}$ (c) $\frac{V}{\sqrt{2}R}$ (d) $\frac{\sqrt{2}V}{R}$

16. During no-load test an induction motor draws power :
- (a) For core loss & windage & Friction loss
 (b) For core loss and copper loss
 (c) For copper loss and windage and Friction loss
 (d) Only for the very small copper loss.
17. The "type" of a transfer function denotes the number of
 (a) Zeros at origin (b) Poles at infinity
 (c) Poles at origin (d) finite poles
18. The characteristic equation of a system is
 $2s^2 + 4s + 9 = 0$
 The system is
 (a) Critically damped (b) under damped
 (c) Over damped (d) none of these
19. The steady state error for a type 3 system in following a unit step input is
 (a) Zero (b) Infinity (c) one (d) none of these
20. The frequency at which Nyquist diagram crosses the negative real axis is known as
 (a) gain crossover frequency (b) phase crossover frequency
 (c) natural frequency (d) breakaway point
21. Which of the following is an open-loop control system?
 (a) Field controlled d.c. motor. (b) Ward Leonard control.
 (c) Armature controlled d.c motor. (d) Stroboscope.
22. The open loop transfer function of a unity feedback system is given by $G(s) = \frac{Ks}{(s+1)(s+2)(s+3)}$
 The number of asymptotes of the root locus plot that tend to infinity is given by
 (a) 1 (b) 2 (c) 0 (d) 3
23. A system which has some roots with real parts equal to zero, but none with positive real parts, is
 (a) relatively stable, (b) marginally stable, (c) absolutely stable, (d) absolutely unstable
24. A wire is placed on the top of a transmission line acts as
 (a) acts as a phase wire
 (b) acts as neutral
 (c) acts as a transmission wire
 (d) acts as ground wire

25. Corona losses are minimized when
 (a) conductors size is reduced
 (b) smooth conductor is used
 (c) sharp points are provided in the line hardware
 (d) current density in conductors is reduced
26. The ac voltmeter using PMMC measures
 (a) true RMS voltage,
 (b) peak voltage
 (c) average voltage
 (d) instantaneous voltage
27. In a 20kohm/V sensitivity multi-meter, the input resistance for measuring ac voltage in 10V full scale deflection is
 (a) 200kohn
 (b) 20kohm
 (c) 10kohm
 (d) 2kohm
28. Kelvin's bridge is used to measure (a) voltage (b) current (c) power (d) resistance
29. When measuring power with an electro-dynamometer wattmeter in a circuit having a low power factor:
 (a) The current coil should be connected on the load side
 (b) The current coil should be connected on the supply side
 (c) A compensated wattmeter with pressure coil connected on the load side
 (d) The pressure coil should be connected on the load side should be used
30. 15. The conductor of a 10 km long, single phase, two wire line are separated by a distance of 1.5 m. The diameter of each conductor is 1 cm, If the conductors are of copper, the inductance of the circuit is
 (a) 50.0 mH
 (b) 45.3 mH
 (c) 23.8 mH
 (d) 19.6 mH
31. The per unit impedance of a circuit element is 0.15. If the base kV and base MVA are halved, then the new value of the per unit impedance of the circuit element will be
 (a) 0.075
 (b) 0.15
 (c) 0.30
 (d) 0.600
32. Maximum power transfer through line $V_1 = 110$ kv, $V_2 = 100$ kv, $X = 22$ ohm is
 (a) 500 MW
 (b) 500 KW
 (c) 250 MW
 (d) 250 KW
33. Zero sequence currents doesn't exist in the following fault
 (a) L-G
 (b) L-L
 (c) L-L-G
 (d) L-L-L-G

34. Advantages of Zener Diode regulator are

- (a) Complex circuit, heavy weight, more reliable
- (b) Simple circuit, heavy weight, more reliable
- (c) Simple circuit, light weight, more reliable
- (d) Simple circuit, light weight, less reliable

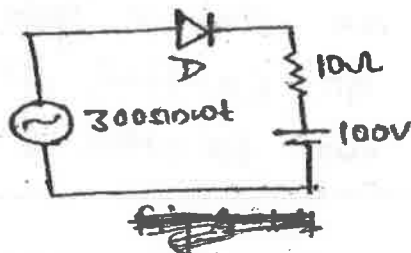
35. At present, the state of the art devices are available as under:

MOSFET	BJT
(a) 1200V, 800A	500V, 140A
(b) 500V, 140A	1200V, 800A
(c) 800V, 1000A	1000V, 1200A
(d) 200V, 140A	1500V, 800A

36. Which of the following are two important result of De Morgan's law?

- (a) $A+B = \bar{A} \cdot \bar{B}$ and $A \cdot B = \overline{A+B}$
- (b) $\bar{A} + \bar{B} = AB$ and $\bar{A} \cdot \bar{B} = \overline{A+B}$
- (c) $\overline{A+B} = \bar{A} \cdot \bar{B}$ and $\overline{A \cdot B} = \bar{A} + \bar{B}$
- (d) $\overline{A+B} = A \cdot B$ and $\overline{A \cdot B} = A+B$

37. In Fig ~~A~~, PIV Required for the diode is



- (a) 300V
- (b) 100V
- (c) 200V
- (d) 400V

38. For a BJT in a CE configuration typical values for $V_{CE(sat)}$, $V_{BE(sat)}$ and $V_{BE(Active)}$ are respectively:

- (a) 0.7V, 0.8V, 0.2V (b) 0.7V, 0.2V, 0.8V
(c) 0.8V, 0.2V, 0.7V (d) 0.2V, 0.8V, 0.7V

39. In a BJT, $I_{CO} = I_{CBO} = 2 \mu A$ and the values of α , the CB current gain of the transistor is 0.99, the value of collector to base cut-off current will be

- (a) 2 μA (b) 99 μA
(c) 200 μA (d) 198 μA

40. The forward voltage drop during SCR on-state is 1.5V. This voltage drop

- (a) Remain constant and is independent of load current
(b) increases slightly with load current
(c) Decreases slightly with load current
(d) varies linearly with load current.

41. The output of a logic gate is '1' when all its inputs are at logic '0'. The gate is either

- (a) a NAND or an EX-OR gate
(b) a NOR or an EX-OR gate
(c) an AND or an EX-NOR gate
(d) a NOR or an EX-NOR gate

42. During forward blocking state, a thyristor is associated with
- (a) Large current, low voltage
 - (b) Low current, large voltage
 - (c) Medium current, large voltage
 - (d) Low current, medium voltage

43. In controlled rectifiers, the nature of load current, i.e. whether load current is continuous or discontinuous.
- (a) Does not depend on type of load and firing angle delay
 - (b) Depends both on the type of load and firing angle delay
 - (c) Depends only on the type of load
 - (d) Depends only on the firing angle delay.

44. In a single-phase full converter, the output voltage during overlap is equal to
- (a) zero
 - (b) source voltage
 - (c) source voltage minus the inductance drop
 - (d) inductance drop.

45. For a given MOSFET transconductance g_m is proportional to dc bias current I_D as:
- (a) $g_m \propto I_D$
 - (b) $g_m \propto \sqrt{I_D}$
 - (c) $g_m \propto 1/I_D$
 - (d) $g_m \propto I_D^2$

46. In a 3-phase semiconductor, the three SCRs are triggered at an interval of
 (a) 60° (b) 90° (c) 120° (d) 180°

47. An ideal OPAMP is used to make an inverting amplifier. The two input terminals of the OPAMP are at the same potential because
 (a) The two input terminals are directly shorted externally.
 (b) The input impedance of the OPAMP is infinity.
 (c) The open loop gain of the OPAMP is infinity.
 (d) CMRR is infinity.

48. For type-A chopper, V_s is the source voltage, R is the load resistance and α is the duty cycle. The average output voltage and current for this chopper are respectively
 (a) $\alpha V_s, \alpha(V_s/R)$ (b) $(1-\alpha)V_s, (1-\alpha)V_s/R$
 (c) $V_s/\alpha, V_s/\alpha R$ (d) $V_s/(1-\alpha), V_s/(1-\alpha)R$

49.

90° a JFET

- (i) Pinch-off voltage decreases if the channel doping is reduced
- (ii) The transconductance decreases if the channel length is reduced
- (iii) The transit time of the carriers in the channel is reduced if the gate area is reduced
- Of these statements: —
- (a) 1 and 2 are correct (b) 1 and 3 are correct
 (c) 2 and 3 are correct (d) all, 2 and 3 are correct

50.

A single-phase voltage controller is connected to a load of resistance 10Ω and supply of $200 \sin 314t$ V. For a firing angle of 90° , the average thyristor current in ampere

- (a) 10 (b) $10/\pi$ (c) $5/\sqrt{2}\pi$ (d) $5\sqrt{2}$

