RPSC

Previous Year Paper

Lecturer (2014)

Section 1 - Lect Electrical Engg

No. of Questions: 100
Duration in Minutes: 120

1) The stator of a 415V, 50 Hz, 4-pole slip ring Induction Motor is excited by rated frequency with slip rings open circuited. The rotor is made to rotate at a speed of 600 rpm in the opposite direction to the normal direction, The frequency of induced voltage across slip ring is

A) 30 Hz
B) 70 Hz
C) 20 Hz
D) 35 Hz

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2) A DC shunt motor has rated rpm of 480. Certain industrial application requires this motor to run at 540 rpm for some time. Which speed control will be desirable?

A) Ward Leonard control
B) Armature current control
C) Field resistance control
D) It is not possible to run the motor at more than the rated rpm

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3) A single phase transmission line consists of two parallel conductors one meter apart and 1.25 cm in diameter. The loop inductance per km of the line is:

A) 21.3×10^{-4} Henry/ km
B) 34.3×10^{-7} Henry/ km
C) 11.5×10^{-7} Henry/ km
D) 19.5×10^{-7} Henry/ km

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4) Capacitance grading of cable implies

A) grading according to capacitance of cables per kilometer length
B) cables using single dielectric in different concentrations
C) use of dielectrics of different permeabilities
D) capacitance required to be introduced at different length to counter the effect of inductance

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5) One out of the following statements is not true:

A) The curl of gradient of any scalar field is identically zero
B) The divergence of curl of any vector field is identically zero
C) A field, which has zero divergence, is said to be solenoidal
D) A field, whose curl is zero, is said to be rotational

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6) In a loss-free R-L-C circuit the transient current will be:

A) Oscillating
B) Non-oscillating
C) Sinusoidal wave
D) Square wave

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7) Which statement out of the following is a wrong statement with regard to Induction motor?

A) Auto-transformer starter is costlier to “direct on line” (DOL) starter
B) DOL starter is used for motors up to 5 horse power only
C) Auto transformer starter is used for motors up to 20 horse power only
D) Star delta starter connects the motor first in delta at the time of starting then in star for running

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8) In the measurement of power of balanced load by two wattmeter method in a 3-phase circuit, The readings of the wattmeters are 4 kW and 2 kW respectively, the later is being taken after reversing the connections of current coil. the power factor and reactive power of the load is

A) 0.2 & 6 kVAR
B) 0.2 & 6 √3 kVAR
C) 0.32 & 2 kVAR
D) 0.32 & 2 √3 kVAR

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9) The RMS value of a half-wave rectified current is 10 Ampere. Its value for full-wave rectification would be:

A) 10 Ampere
B) 14.14 Ampere
C) 31.4 Ampere
D) 20 Ampere

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10) One of the following does not represent a valid combination of ‘Class’ of insulating material and its limiting temperature in 'Degree Centigrade'.

A) ‘Class- A’ – 105^0C
B) ‘Class- F’ – 155^0C
C) ‘Class- H’ – 180^0C
D) ‘Class- B’ – 120^0C

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11) On a base of 132 kV, 100 MVA, a transmission line has 0.2 per unit impedance. On a base of 220 kV, 50 MVA, it will have a per unit impedance of:

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

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

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

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

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12) In which of the following power plants the availability of power is least reliable?

A) Solar power plant
B) Wind energy
C) Tidal power plant
D) Geothermal power plant

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13) Overall thermal efficiency of a steam power station in India is in the range:

A) 18-24 percent
B) 30-40 percent
C) 44-62 percent
D) 68-79 percent

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14) A system having T.F. $\frac{1}{(s+1)}$ is excited by a step function of magnitude '3'. The time required by output to reach upto 96% of its steady state value is

A) 0.54 sec
B) 1.23 sec
C) 2.08 sec
D) 3.22 sec

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15) The burden value in Potential Transformer (PT) should be _____ to achieve low errors in PT:

A) low
B) high
C) medium
D) infinite

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16) For complete protection of a three-phase line:

A) three Phase relays and three Earth fault relays are required
B) three Phase relays and two Earth fault relays are required
C) two Phase relays and two Earth fault relays are required
D) two Phase relays and one Earth fault relay are required

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17) For a waveform to be expressed in Fourier series, which of the following conditions must be satisfied?
I. Maxwell's conditions,
II. Drichlet conditions,
III. Sampling Theorem

A) I only
B) II only
C) II and III only
D) I, II and III

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18) Which one is not a valid condition for the wave winding?

A) Back pitch and front pitch are of the same sign
B) Back pitch and front pitch are odd numbers
C) Back pitch and front pitch may differ by two and may be equal also
D) Commutator pitch is always unity

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19) For rural electrification in a country like India with complex networks, it is preferable to use:

A) Air circuit breaker
B) Oil circuit breaker
C) Vacuum circuit breaker
D) Minimum oil circuit breaker

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20) Which of the following statements is incorrect?

A) During parallel resonance impedance at resonance is minimum
B) During parallel resonance current is magnified
C) During series resonance current at resonance is maximum
D) During series as well as parallel resonance, the power factor is unity

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21) One of the following is not the Maxwell's equation:

A) $\nabla . \mathrm{D} = P_v$

B) $\nabla . \mathrm{B} = \mathrm{J}$

C) $\nabla * \mathrm{E} = -\frac{\partial \mathrm{B}}{\partial t}$

D) $\nabla * \mathrm{H} = \mathrm{J} + \frac{\partial \mathrm{D}}{\partial t}$

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22) One of the following is not a valid statement:

A) Fleming's right hand rule is used to find out the direction of current in the conductor of a generator
B) Fleming's left hand rule is used to find out the direction of rotation of the armature of DC motor
C) Ampere's rule is used to find out the direction of lines of force around the wire carrying current
D) Right hand thumb rule is used to find out the direction of counter current produced in the armature magnetic field

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23) The number of electrical degrees 'passed through' in one revolution of a 6-pole synchronous alternator is:

A) 360 degree
B) 720 degree

C) 1080 degree
D) 2160 degree

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24) Following is not the property of a complete incidence matrix:

A) Algebraic sum of the column entries of an incidence matrix is zero
B) The rank of a complete incidence matrix of a connected graph is (n - 1), where n is total number of nodes
C) Order of a complete incidence matrix will be $(n * b)$, where b is total number of branches and n is total number of nodes
D) Determinant of the incidence matrix of a closed loop is not zero.

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25) An ideal current source has zero:

A) internal resistance
B) internal conductance
C) voltage at no-load
D) ripples

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26) If the frequency of input voltage of a transformer is increased keeping the magnitude of voltage unchanged, then:

A) both hysteresis loss and eddy current loss in the core will increase
B) hysteresis loss will increase but eddy current loss will decrease
C) hysteresis loss will decrease but eddy current loss will increase
D) hysteresis loss will decrease but eddy current loss will remain unchanged

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27) The superposition theorem is applicable to:

A) linear response only
B) linear and non-linear response
C) non-linear and time-variant response
D) linear, non-linear and time-variant response

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28) Which motor is generally used in Tap Recorders?

A) universal motor
B) reluctance motor
C) split phase motor
D) hysteresis motor

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29) A gas turbine works on:

A) Carnot cycle
B) Brayton cycle
C) Dual cycle
D) Rankine cycle

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30) In practice, a current source inverter consists of an AC/ DC converter with a large inductance 'L' in the output. This inductance maintains a ……. ……through the switching devices over short interval of time.

A) constant current
B) constant voltage
C) constant power
D) none of the (A), (B), (C)

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31) If the input to a differentiating circuit is a saw-tooth wave, then output will be …….. wave:

A) square
B) rectangular wave
C) triangular wave
D) rectified sine wave

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32) A unit ramp function when integrated yields:

A) unit parabolic function
B) unit ramp function
C) unit doublet
D) unit impulse function

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33) Which of the following statements is not valid in case of conductors in electrostatic fields?

A) The static electric field intensity inside a conductor is zero
B) The static electric field intensity at the surface of a conductor is everywhere directed normal to the surface
C) The conductor surface is an equivalent potential surface
D) None of the above

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34) The leakage flux in a transformer depends upon:

A) load current
B) load current and voltage
C) load current, voltage and frequency
D) load current, voltage, frequency and power factor

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35) Which of the following company is associated with manufacture of high capacity transformers in India?

A) M/S National Thermal Power Corporation Limited
B) M/S Bharat Heavy Electricals Limited
C) M/S Heavy Engineering Corporation Limited
D) M/S Electricity Authority of India

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36) In case of semi-conductors, the ratio of conduction current to displacement current is:

A) more than 200 and less than 1000
B) less than 100 but greater than 1/100

C) less than 1/100
D) more than 1000

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37) A large hydropower station has a head of 324 metre and an average flow of 1370 metre^3/ second. The available hydraulic power from this station will be:

A) 4.35 MW
B) 4.15 MW
C) 4.47 MW
D) 4.73 MW

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38) Which among the given statement is/are CORRECT.

(a) Avalanche breakdown voltage increases with temperature
(b) Zener breakdown voltage decreases with temperature

A) Only (a)
B) Only (b)
C) Both (a) & (b)
D) None of (a) & (b)

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39) The operation of the relay which is most affected due to arc resistance is

A) Mho relay
B) Reactance relay
C) Impedance relay
D) All are equally affected

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40) The reactance relay is essentially:

A) an over-voltage relay with current restraint
B) an over-voltage relay with directional restraint
C) a directional relay with voltage restraint
D) a directional relay with current restraint

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41) An 8-pole alternator runs at 750 rpm and supplies power to a 6-pole induction motor which has a full load slip of 3 percent. The full load speed of the induction motor will be:

A) 1000 rpm
B) 920 rpm
C) 950 rpm
D) 970 rpm

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42) For AC networks, as per maximum power transfer theorem, for maximum power transfer, the source impedance should be equal to:

A) twice the load impedance
B) complex conjugate of load impedance

C) twice the complex conjugate of load impedance
D) none of these

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43) In power station practice “spinning reserve” is:

A) reserve generating capacity that is in operation but not in service
B) reserve generating capacity that is connected to bus and ready to take the load
C) reserve generating capacity that is available for service but not in operation
D) capacity of the part of the plant that remains under maintenance

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44) An open loop system represented by the transfer function

$$G(s) = \frac{(s-1)}{(s+2)(s+3)}$$ is

A) Stable and of the minimum phase type
B) Stable and of the non - minimum phase type
C) Unstable and of the minimum phase type
D) Unstable and of non-minimum phase type

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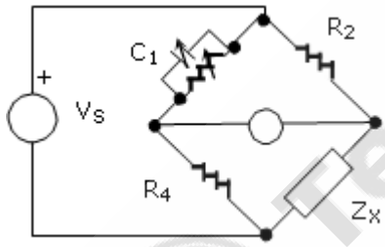
45) The bridge circuit shown in the figure below is used for the measurement of an unknown element ZX.

The bridge circuit is best suited when ZX is a



A) low resistance
B) high resistance
C) low Q inductor
D) lossy capacitor

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46) Which of the following plants will take least time in starting from cold conditions to full-load operation?

A) Nuclear power plant
B) Steam power plant
C) Hydro-electric power plant
D) Gas turbine plant

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47) Which of the following are the basic elements in a 555 timer IC?

(a) Two comparators

(b) A flip-flop
(c) A discharge transistor
(d) A resistive voltage divider

A) (a), (b) and (d)
B) only (a), (b) and (c)
C) only (b), (c) and (d)
D) only (a), (b), (c) and (d)

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48) Which waveform out of the following waves has the least value of form-factor:

A) Triangular wave
B) Square wave
C) Rectangular wave
D) Sine wave

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49) Which type of protection is provided on a generator to protect against stator insulation failure?

A) Differential protection
B) Overcurrent relay
C) Thermocouple actuated alarm
D) Reverse power relay

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50) In an alternator if the winding is short pitched by 60 electrical degrees, its pitch factor will be:

A) 1.0
B) 0.866
C) 0.75
D) 0.50

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51) The inertia constant of a 100 MVA, 11 kV water wheel generator is 4. The energy stored in the rotor at the synchronous speed is:

A) 400 Mega Joule
B) 400 Kilo Joule
C) 25 Mega Joule
D) 25 Kilo Joule

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52)

If the voltage across and the current into a certain load or part of the circuit are expressed by $I = |I| \angle\beta$, respectively. Reactive power (VI^*) will be ..... when the phase angle $\angle(\alpha - \beta$ and current is .....

A) positive, positive
B) negative, negative
C) negative, positive
D) positive, negative

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53) The reflection coefficient of a short-circuited line for voltage is:

A) -1
B) +1
C) 0.5
D) zero

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54) The typical ratio of latching current to holding current in a 20A thyristor is

A) 5.0
B) 2.0
C) 1.0
D) 0.5

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55) If the primary fault current is 2000 ampere, the relay setting current is 50 percent and the CT ratio is 400/5, then the plug-setting multiplier is:

A) 25
B) 15
C) 50
D) None of the above

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56) Highest flux density exists inside which of the following instruments?

A) Electrodynamic instruments
B) Hot wire instruments
C) Moving iron instruments
D) Moving coil instruments

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57) The current gain of emitter follower is:

A) less than one
B) more than one
C) zero
D) unpredictable

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58) A half-controlled single-phase bridge rectifier is supplying an R-L load. It is operated at a firing angle α and the load current is continuous. The fraction of cycle that the freewheeling diode conducts is

A) $\frac{1}{2}$
B) $1-\frac{\alpha}{\pi}$
C) $\frac{\alpha}{2\pi}$

D) $\frac{\alpha}{\pi}$

59) Which statement out of the following statements about 'corona' is incorrect?

A) Corona gives rise to radio interference
B) Corona results in loss of power in transmission
C) Corona discharge can be observed as red luminescence
D) Corona is always accompanied by a hissing voice

60) A three-phase transformer, connected in star-delta, is composed of three single-phase transformers, each rated 127/ 13.2 kV. The line-to-line voltage ratio for the three-phase transformer is:

A) 220 / 13.2 kV
B) 127 / 13.2 kV
C) 127 / 220 kV
D) 220 / 220 kV

61) Synchronous wattage of induction motor means:

A) rotor input in watts
B) stator input in watts
C) combined stator and rotor input in watts
D) shaft output in watts

62) The average power delivered to an impedance $4 - j\,3\ \Omega$ by a current $5\cos(100\pi t + 100)$ Ampere is

A) 44.2 W
B) 50 W
C) 62.5 W
D) 125 W

63) Two 220 volt lamps, one of 60 watt and the other of 75 watt are connected in series across a 440 volt supply. The potential difference across 60 watt lamp will be:

A) 195 volt
B) 220 volt
C) 245 volt
D) 440 volt

64) lumen / watt is the unit of:

A) light flux
B) luminous intensity
C) brightness
D) luminous efficiency

65) The load-flow solution is always assured in case of:

A) Newon-Raphson method
B) Gauss-Seidal method
C) Fast Decoupled method
D) None of these methods guarantee

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66) Full load current of an Induction motor is 20 Ampere. The no-load current may be expected to be:

A) 25 Ampere to 28 Ampere
B) 15 Ampere to 18 Ampere
C) 11 Ampere to 14 Ampere
D) 6 Ampere to 10 Ampere

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67) Which of the following relation is incorrect?

A) capacity factor = utilization factor x load factor
B) load factor x maximum load = average load
C) demand factor x connected load = maximum demand
D) none of these

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68) The inrush current of a transformer at no-load is maximum, if it is switched-on when the supply voltage is at:

A) zero voltage value
B) at peak voltage value
C) at half of the peak voltage value
D) at 0.866 of the peak voltage value

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69) A generating station has a maximum demand of 500 MW. The annual load factor is 50 percent. The energy generated per annum will be:

A) 2.19×10^6 MWhr
B) 600 MWhr
C) 250 MWhr
D) 7.50×10^6 MWhr

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70) A DC reactor is connected in series with each pole of a converter station in order to:

A) prevent commutation failures in the inverter
B) supply reactive power to the converter
C) improve system stability
D) increase the power transfer capability

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71) The total inductance of two coupled coils in the 'series aiding' and 'series opposing' connections are 1.4×10^{-3} Henry and 0.6×10^{-3} Henry, respectively. The value of mutual inductance will be:

A) 0.8×10^{-3} Henry
B) 10^{-3} Henry

C) 0.2 x 10^{-3} Henry
D) 0.5 x 10^{-3} Henry

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72) Two stator windings of AC servomotors are oriented:

A) 90 degree (mechanical) apart
B) 90 degree (electrical) apart
C) 180 degree (mechanical) apart
D) 180 degree (electrical) apart

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73) A 10A DC Ammeter has a resistance of 0.1 Ω is to be extended to 50 A, the required shunt wire is

A) Manganin wire of 20 m Ω
B) Constantan wire of 20 m Ω
C) Manganin wire of 25 m Ω
D) Constantan wire of 25 m Ω

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74) Two single-phase 150 kVA, 7200/ 600 volt transformers are connected in open-delta. The maximum three-phase load that they can carry is:

A) 300 kVA
B) 75 kVA
C) 259 kVA
D) 249 kVA

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75) A DC Motor develops a torque of 150 N-m. A 10 percent reduction in the field flux causes a 50 percent increase in armature current. The new value of torque is:

A) 102.5 N-m
B) 202.5 N-m
C) 172.5 N-m
D) 232.5 N-m

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76) Natural commutation means:

A) reducing the thyristor current to zero
B) reducing the thyristor current below “holding current”
C) reducing the current to zero and allowing time to recover thristor junctions
D) none of (A), (B) and (C)

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77) The characteristic equation of a simple servo system is $s^2+6s+25=0$. Damping factor of the system is:

A) 3.2
B) 2.4
C) 1.8
D) 2.9

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78) The property of materials by which they can be drawn into wires is known as:

A) malleability
B) elasticity
C) creep
D) ductility

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79) Full load cupper loss in a transformer is 1600 watts. At half load the cupper loss will be:

A) 6400 watt
B) 1600 watt
C) 800 watt
D) 400 watt

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80) Which braking system on the locomotives is the costliest among the following?

A) Vacuum braking on diesel locomotives
B) Vacuum braking on steam locomotives
C) Regenerative braking on electric locomotives
D) All braking systems are equally costly

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81) In a microprocessor, the address of the next instruction to be executed, is stored in

A) Stack pointer
B) Address latch
C) Program counter
D) General purpose register

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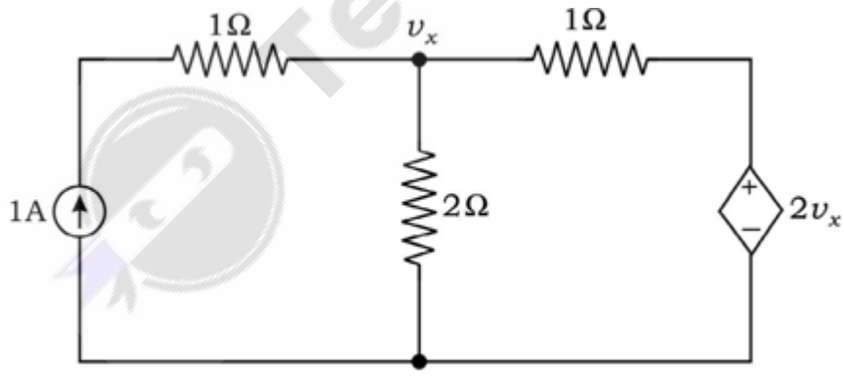
82) vx in the network below is:



A) 1 Volt
B) -2 Volt
C) –1 Volt
D) 2 Volt

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83) A system is critically damped. If the gain of the system is increased, the system will behave as:

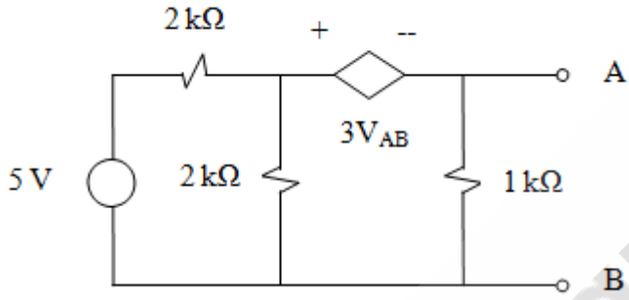
A) overdamped

B) underdamped
C) oscillatory
D) critically damped

84) An ideal voltage source will charge an ideal capacitor

A) in infinite time
B) exponentially
C) instantaneously
D) cannot be guessed

85) For the circuit given below, the Thevenin's resistance across the terminals A and B is



A) 2 kΩ
B) 0.2 kΩ
C) 5 kΩ
D) 0.5 kΩ

86) A high-pass filter has a resistance R = 2 kΩ The lowest input frequency to be passed is 7.5 kHz. The value of suitable coupling capacitor must be:

A) 0.001 pico Farad
B) 0.01 pico Farad
C) 0.1 pico Farad
D) 1 pico Farad

87) A long transmission line has considerable …….. effect.

A) series capacitance
B) shunt capacitance
C) series inductance
D) shunt inductance

88) For the protection of parallel feeders fed from one end, the relays used are:

A) non-directional relays at the source-end and directional relays at the load-end
B) non-directional relays at both the ends
C) directional relays at the source-end and non-directional at the load-end
D) directional relays at both the ends

89) The bridge used to measure the dielectric loss of an insulator is:

A) Anderson bridge
B) Wien's bridge
C) Schering bridge
D) Any of the above

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90) In a series RLC circuit at resonance, the magnitude of the voltage developed across the capacitor

A) is always zero
B) can never be greater than the input voltage
C) can be greater than the input voltage, however, it is 90° out of phase with the input voltage
D) can be greater than the input voltage, and is in phase with the input voltage.

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91) A 200 milli-Ampere meter has accuracy of $\pm$ 0.5 percent. Its accuracy while reading 100 milli-Ampere will be:

A) $\pm$ 2.5 percent
B) $\pm$ 5 percent
C) $\pm$ 7.5 percent
D) $\pm$ 10 percent

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92) In air-blast circuit breakers, the pressure of the air is of the order of:

A) 100 mm Hg
B) 1 kg / cm^2
C) 20 kg / cm^2 to 30 kg / cm^2
D) 200 kg / cm^2 to 300 kg / cm^2

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93) A passive 2-port network is in a steady-state compared to its input, the steady state output can never offer

A) higher voltage
B) lower impedance
C) greater power
D) better regulation

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94) Decimal equivalent of Hexadecimal number $(C3B1)_{16}$ is:

A) 12197
B) 32097
C) 52097
D) 50097

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95) The driving power from the prime-mover driving the alternator is lost but the alternator remains connected to the supply network; the field supply also remains on. The alternator will:

A) get burnt
B) behave as an induction motor but will rotate in the opposite direction
C) behave as a synchronous motor and will rotate in the same direction
D) behave as a synchronous motor but will rotate in a reverse direction to that corresponding to generator action

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96) Impulse testing of transformers is done to determine the ability of:

A) bushings to withstand vibrations
B) insulation to withstand transient voltages
C) windings to withstand voltage fluctuations
D) all of the above

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97) The 8O85 assembly language instruction that stores the contents of H and L registers into the memory locations 2050_H and 2051_H, respectively, is:

A) SPHL 2050_H
B) SPHL 2051_H
C) SHLD 2050_H
D) STAX 2050_H

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98) In an 8085 microprocessor, after the execution of **XRA A** instruction

A) the carry flag is set
B) the accumulator contains FF_H
C) the zero flag is set
D) the accumulator contents are shifted left by one bit

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99) The melting point of carbon is:

A) 1800 degree Centigrade
B) 2200 degree Centigrade
C) 3500 degree Centigrade
D) 5500 degree Centigrade

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100) A power system is subjected to a fault which makes the zero sequence component of current equal to zero. The nature of fault current is:

A) Double line to ground fault
B) Line to line fault
C) Line to ground fault
D) Three-phase to ground fault
