

PROFESSIONAL ELECTRICAL ENGINEERING SUBJECTS #1-#69 - REE - Sept. 2015

INSTRUCTION: Select the correct answer for each of the following questions. Mark **only one answer** for each item by shading the box corresponding to the letter of your choice on the answer sheet provided. **STRICTLY NO ERASURES ALLOWED.**
Use pencil **No. 2** only.

MULTIPLE CHOICE:

- Heating effect of current has an undesirable side effect in
A. electric oven B. immersion heater C. electric iron **D. vacuum cleaner**
- Find the power factor of the impedance $5 \angle -25^\circ \Omega$.
A. 0.423 lagging **B. 0.9063 leading** C. 0.423 leading D. 0.9063 lagging
- Convert the delta connected impedances of $12 \angle 36^\circ \Omega$ to balanced wye connected impedances.
A. $3 \angle 36^\circ \Omega$ B. $6 \angle 36^\circ \Omega$ **C. $4 \angle 36^\circ \Omega$** D. $12 \angle 36^\circ \Omega$
- A series RLC circuit consists of a 5Ω resistor, a 0.2 H inductor and a $50 \mu\text{F}$ capacitor. Compute the resonant frequency.
A. 40 Hz B. 60 Hz **C. 50 Hz** D. 70 Hz
- One KWHR is equal to _____ BTU.
A. 360 **B. 3,413** C. 3,600 D. 1,000
- Given a 100 kVA, 2400/240 V single phase transformer. Find the current transformer (CT) ratio at the low voltage side.
A. 700 : 5 B. 600 : 5 **C. 500 : 5** D. 400 : 5
- Find the total resistance if 3Ω is connected in series with the parallel combination of 4Ω , 5Ω and 20Ω .
A. 4Ω **B. 5Ω** C. 6Ω D. 7Ω
- Find the reactive factor of the load having 30 kW at 50 kVA.
A. 0.6 B. 0.5 **C. 0.8** D. 0.7
- A power plant has a peak demand of 80 MW and a connected load of 150 MW. It produces a total power of 400,000 MWhr annually. What is the annual load factor of the plant?
A. 57.08% B. 30.44% C. 60.88% D. 45.66%
- Find the emf induced on a 0.4 H inductor if the current changes from 10 A to 30 A in 0.2 second.
A. 30 V **B. 40 V** C. 50 V D. 60 V
- What is the total power consumed by the load when the readings of two wattmeters are 5 kW and -0.5 kW?
A. 5.5 kW **B. 4.5 kW** C. 5 kW D. 4.05 kW
- Compute for the core loss if the transformer consumes 75 watts when it is connected across a 240 V source and taking 1.4 A. The primary resistance is 0.25Ω .
A. 73.6 W B. 74.65 W C. 74.75 W **D. 74.51 W**
- If the resistance in a series RC circuit is increased, the magnitude of the phase angle
A. increases **C. decreases** B. remains the same D. changes in an indeterminate manner
- A 4 pole lap winding motor with 16 slots, 42 conductors per slot, 480 V runs at 1800 rpm. Find the flux produced per pole.
A. 11.9 mWb B. 47.6 mWb C. 35.7 mWb **D. 23.8 mWb**
- For an unbalanced load which connection is suitable?
A. 3-wire open delta C. 3-wire delta connection
B. 4-wire wye connection D. 3-wire wye connection
- Find the GMR in terms of the radius r of each conductor in a three bundled conductor arranged horizontally.
A. $1.6699 r$ B. $1.9766 r$ C. $1.8096 r$ **D. $1.7036 r$**
- Condition for maximum power output for a DC motor is
A. $E_b = V$ **B. $E_b = V/2$** C. $E_b = I_a R_a$ D. $E_b = \frac{1}{2} I_a R_a$
- Given a transformer of 8 MVA, 69 KV/13.8 KV with 7% impedance, find the new per unit impedance at 100 MVA, 67 KV base.
A. 0.928 pu B. 0.901 pu C. 0.113 pu D. 0.875 pu
- A balanced delta connected load has impedances $Z_1 = Z_2 = Z_3$. What is the per phase equivalent impedance in wye?
A. $Z_1/3$ B. $3Z_1$ C. $2Z_1/3$ D. Z_1

$$A \rightarrow Z_1 = Z_2 = Z_3$$

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20. Nuclear reactors generally employ
A. fusion
B. fission
C. both fusion and fission
D. none of these
21. A 110 V DC motor draws an armature current of 16 A. If the armature resistance is 0.25 Ω , compute for the back emf.
A. 117 V
B. 114 V
C. 106 V
D. 110 V
22. One conductor of a three phase line is open. The current flowing to the delta connected load through line A is 20A. With the current in line A as reference and assuming that line C is open, what is the positive sequence current of phase C?
A. $10 + j5.78$
B. $10 - j5.78$
C. $-10 - j11.56$
D. $j11.56$
23. In a parallel circuit the potential difference across the resistance
A. varies
B. is different from the applied voltage
C. is sometimes constant
D. is always constant
24. What is the primary advantage of FM over AM?
A. FM has a greater bandwidth than AM
B. noise immunity
C. more complex
D. greater capture effect
25. What is the IEEE device function number 21?
A. overvoltage relay **59**
B. undervoltage relay **27**
C. distance relay
D. differential relay **87**
26. Two resistors R_1 and R_2 are connected in parallel. R_1 is twice of R_2 . If the current in R_1 is I , what is the current in R_2 ?
A. I
B. $2I$
C. $4I$
D. $I/2$
27. Which is not included in a basic communication circuit?
A. antenna
B. transmitter
C. communication channel
D. receiver
28. A 1 m long conductor is moved in a field of density 1 Wb/m² at a velocity of 30 m/s. What is the emf induced if the motion is perpendicular to the field?
A. 20 V
B. 30 V
C. 15 V
D. 25 V
29. When the sole purpose of an alternating current is to produce heat, the selection of conductor is based on _____ value of the current.
A. average
B. instantaneous
C. root mean square
D. peak
30. The primary of transformer has 200 turns and is excited by a 240 V, 60 Hz source. What is the maximum value of the core flux?
A. 4.04 mWb
B. 4.40 mWb
C. 4.13 mWb
D. 4.32 mWb
31. A 115 kV three-phase transposed transmission line is composed of 2-ACSR 336, 400 cmil, 30/7 Oriole conductors per phase with horizontal configuration : $D_{12} = 7$ ft , $D_{23} = 7$ ft, $D_{13} = 14$ ft. The line spacing is measured from the center of the bundled conductors. The distance between the conductors of the bundle is 6 inches. The conductors have a diameter of 0.741 inch and a GMR of 0.02255 ft. Find the capacitance per phase for 20 km of the line in microfarads.
A. 0.1300
B. 0.2719
C. 0.2889
D. 0.2609
32. A light source located 5m from a surface produces an illumination of 450 lux on the surface. Find the distance of the light source from the surface if the illumination is 900 lux.
A. 3.54 m
B. 3.45 m
C. 4.35 m
D. 4.53 m
33. A walkman has 4-AA batteries. The combination has a capacity of 200 watt-sec. How long will it take to discharge if walkman consumes 10 mA at 6 V?
A. 55.6 min
B. 65.6 min
C. 45.6 min
D. 75.6 min
34. A 24.6 μF capacitor stores an energy $W = 12\sin^2 377t$ J. Find the current through it.
A. $4 \sin 377t$
B. $4 \cos 377t$
C. $9.16 \sin 377t$
D. $9.16 \cos 377t$
35. A type of electronics communication in which only one party transmits at a time.
A. Full Duplex
B. Half duplex
C. Bicorn
D. Simplex

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36. Two wattmeters can be used to measure 3-phase power for a
 A. balanced and unbalanced load
 B. unbalanced load only
 C. balanced load only
 D. unity power factor only
37. Given a transformer of 15 MVA, 69 KV/13.8 KV with 5% impedance, find the new per unit impedance at 100 MVA, 67 KV base.
 A. 0.314 pu
 B. 0.333 pu
 C. 0.354 pu
 D. 0.111 pu
38. A capacitor is used to charge the lamp of the flash of a camera. If the source voltage is 6 V, how long will it take to charge the capacitor of 10 μF if it takes 10 μA current.
 A. 4 sec
 B. 8 sec
 C. 6 sec
 D. 10 sec
39. What is the total resistance of eleven 33 k Ω resistors connected in parallel?
 A. 33 k Ω
 B. 3 k Ω
 C. 363 k Ω
 D. 11 k Ω
40. The specific resistance ρ is defined as
 A. resistance of a conductor which has a length of 1 m and cross-section of 1 m^2 at 20°C
 B. resistance of any conductor at 25°C
 C. resistance of any conductor at 20°C
 D. resistance of a conductor which has a length of 1 m and cross-section of 1 cm^2 at 20°C
41. How many 150-watt lamps can be supplied by a 4,800 VA branch circuit?
 A. 38
 B. 36
 C. 34
 D. 32
42. Which of the following is not included in the evaluation of the Technical Performance of a Distribution System according to Philippine Distribution Code (PDC)?
 A. Power Quality
 C. Collecting Efficiency
 B. Reliability
 D. System Efficiency
43. A three-phase induction motor delivers 100 HP while operating at 80% efficiency and a power factor of 0.75 lagging from 480 V lines. A delta connected power factor correction capacitor is to be installed to improve the overall power factor to 0.90 lagging. Determine the required capacitance per phase.
 A. 246.4 μF
 B. 142.2 μF
 C. 41.1 μF
 D. 47.4 μF
44. The resistance phasor for a series RC circuit points to the right. The capacitive reactance phasor points _____ while the diagonal of the rectangle having these two phasors as sides represents the _____.
 B. down, impedance
 A. up, impedance
 C. left, current
 D. up, total voltage
45. The phase angle for a series RC circuit may be computed as the angle between the _____ and _____ phasors.
 A. resistance, impedance
 B. resistance, reactance
 C. resistance, capacitance
 D. impedance, reactance
46. What is the formula for the synchronous speed of a motor?
 C. $N_s = \frac{120f}{P}$
 A. $N_s = \frac{120P}{f}$
 B. $N_s = 120fP$
 D. $N_s = \frac{60f}{P}$
47. A 25 KVA transformer supplies a load of 12 KW at a power factor of 0.6 lagging. Find the maximum KVA load at a power factor of 0.866 leading can be added without overloading the transformer.
 A. 16.6
 B. 13.2
 C. 22
 D. 12.8
48. What is the type of relay that is intended to respond to the difference between incoming and outgoing electrical quantities?
 B. Differential
 A. Directional
 C. Subtractive
 D. Distance
49. When two resistors R_1 and R_2 are connected in parallel across a battery, they consume a total of 50 W and draw a total current of 5A. When the two resistors are then connected in series across the same battery, they consume a total of 225 W with the same total current of 5 A. Determine R_1 and R_2 .
 C. 6 Ω and 3 Ω
 A. 3 Ω and 8 Ω
 B. 9 Ω and 6 Ω
 D. 6 Ω and 4 Ω
50. A series RL circuit is connected across a 120 V, 60 Hz source and draws a current of 0.5 A at 0.70 lagging pf. Determine the values of R and L.
 C. R= 168 Ω , L= 0.455 H
 A. R= 171 Ω , L= 0.455 H
 B. R= 171 Ω , L= 0.445 H
 D. R= 168 Ω , L= 0.445 H
51. Transformer A is in parallel with transformer B. If the equivalent impedance of transformer B is greater than A, then,
 A. KVA share of transformer A is greater than that of B
 B. KVA share of transformer A is less than that of B
 C. KVA share of transformer B is greater than that of A
 D. the two transformers will have equal share

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52. What is the minimum ampacity of branch circuit conductor for a hermetic motor whose full-load current is 20 A?
A. 15 A B. 20 A **C. 25 A** D. 30 A
53. Which is not a characteristic of an ideal transformer?
A. finite permeability C. no losses
B. infinite permeability D. no leakage flux
54. Two capacitors in series are charged across a 24 V source. If C_1 is 12 picofarads, and the voltage across it is 6 V, find C_2 .
A. 6 pF B. 8 pF C. 2 pF **D. 4 pF**
55. Two million cubic meters of water is stored in a reservoir feeding a water turbine. If the center of mass of the water is 50 m above the turbine and losses are negligible, how much power in MWHR per second will that volume of water produce? The density of water is 993 kg/m^3 .
A. 135 B. 253 **C. 271** D. 293
56. A three-phase, wye connected, 20 MW load of power factor 0.866 lagging is to be supplied by a transmission line at 138 kV. It is desired that the line losses not exceed 5 percent of the load. If the per phase resistance of the line is $0.7 \Omega/\text{km}$, what is the maximum length if the line?
A. 51 km B. 42 km C. 63 km D. 56 km
57. Base on the Philippine Distribution Code (PDC), the Distributor may establish penalties for Users whose power factors are less than
A. 90% **B. 85%** C. 80% D. 75%
58. It is defined as the total number of sustained Customer power Interruptions within a given period divided by the total number of Customers served within the same period.
A. System Average Interruption Frequency Index
B. System Average Interruption Duration Index
C. Customer Average Interruption Frequency Index
D. Customer Average Interruption Duration Index
59. How many 240 V, 20 A branch circuits are required to supply 63,000 VA load?
A. 13 **B. 14** C. 15 D. 12
60. What effect on current flow does reversing the direction of movement of a conductor in the magnetic field of a generator have?
A. it neutralizes the current flow **C. it reverses the direction of current flow**
B. has no effect on current D. none of these
61. Receptacle outlet in a dwelling unit must be installed no more than _____ mm above the floor.
A. 1,700 B. 1,800 C. 3,700 D. 1,600
62. The depletion region of a junction diode forms the _____ of the capacitor.
A. Plates **B. Dielectric** C. Package D. none of these
63. A short three-phase transmission line of 16 km long is delivering power of 65 MW at 64.5 kV and 0.9 pf lagging. The line impedance is $0.125 + j0.4375 \Omega/\text{km}$. Find the line to line sending end voltage.
A. 70.2 kV B. 71.2 kV C. 72.2 kV D. 69.2 kV
64. Which of the following shall be included in the calculation of the reliability standard indices of the distributor asset by the Philippine Distribution Code?
A. Outages that occur on the secondary lines of the distribution system.
B. Planned outages where the customers have been notified at least three (3) days prior to the loss of power.
C. Outages that occur on the primary lines of the distribution system.
D. Outages that occur in the transmission line.
65. As specified by the Energy Regulatory Commission (ERC), a customer is said to be a large customer if its demand is at least 1 MW.
A. 1 B. 2 C. 3 D. 5
66. Calculate for the dc voltage when the converter consumes 1.5 kW of power at a source voltage of 230 V ac.
A. 253 V B. 352 V C. 235 V **D. 325 V**
67. Which of the following can be used as lightning protection for distribution line?
A. lightning arrester C. overhead ground conductor
B. surge arrester **D. surge arrester and overhead ground conductor**
68. What is the rating of fuse as a branch circuit overload protection for a hermetic motor whose full-load current is 20 A?
A. 15 A B. 20 A **C. 25 A** D. 30 A

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69. Silica gel prevents air moisture from entering the outdoor transformer tank. It is placed in
 A. Conservator B. Breather C. Core D. Windings
70. The shunt winding of a machine has a resistance of 80Ω and an inductance of 4 H is suddenly switched on to a 220-volt supply. Find the time taken for the current to rise to half its steady state value?
 A. 0.05 sec B. 0.0346 sec C. 0.0251 sec D. 0.0172 sec
71. What is the force required to separate two surfaces with contact area of 150 sq. cm when the flux density is 2 Tesla normal to the surfaces?
 A. 10,100 N B. 15,800 N C. 23,900 N D. 35,050 N
72. A capacitor is charge 0.23 watt-second of energy at a voltage of 48 volts. What is its capacitance?
 A. 180 μF B. 240 μF C. 200 μF D. 220 μF
73. A four pole DC generator with lap winding has 48 slots and 4 elements per slot. How many coils does it have?
 A. 48 B. 384 C. 96 D. 192
74. Breather mounted on transformer tank contains
 A. Calcium B. Oil C. Water D. Liquid
75. An inductor supplied with 100 V AC with a frequency of 10 kHz passes a current of 10 mA. What is its inductance?
 A. 1.7 H B. 16 mH C. 1 mH D. 160 mH
76. What is the capacitance per kilometer of two parallel wires 7 mm in diameter placed 30 cm apart from each other in air.
 A. $625 \times 10^{-9} \text{ F/km}$ B. $62.5 \times 10^{-9} \text{ F/km}$ C. $6.25 \times 10^{-9} \text{ F/km}$ D. $6.25 \times 10^{-12} \text{ F/km}$
77. The core loss of a 5-kVA single phase transformer with normal voltage applied to the primary is 75 watts. The maximum efficiency occurs at 60% of full-load kVA. What is the full-load efficiency of the transformer at 0.80 power factor?
 A. 95.16% B. 93.38% C. 89.52% D. 91.36%
78. A squirrel cage motor is started at 50% its rated voltage. What is the starting torque relative to its rated voltage starting torque?
 A. 50 % B. 100 % C. 25 % D. 75 %
79. Find the rotor frequency of an induction motor if the rotor speed is 1,145 rpm.
 A. 60 Hz B. 1.25 Hz C. 5.5 Hz D. 2.75 Hz
80. A DC voltmeter is connected across as AC source of 220 V, 60 Hz. What will be the reading of the voltmeter?
 A. 110 V B. 220 V C. 198 V D. 0
81. In an alternator, the armature reaction influences the magnitude of
 A. no-load loss C. terminal voltage/phase
 B. speed of the machine D. waveform of the voltage generated
82. A given capacitor has a capacitance of 100 μF . Calculate its elastance.
 A. 100 B. 10,000 C. 100,000 D. 10
83. Water flows at the rate of $1.5 \text{ m}^3/\text{s}$ from a height of 100 m which drive a turbine connected to a 150 rpm generator. Determine the turbine brake power if the frictional torque is 600 N-m.
 A. 1,462 kW B. 1,862 kW C. 1,642 kW D. 1,264 kW
84. A complete transposed 60 Hz three phase transmission line has a flat horizontal configuration and spaced 3m between adjacent conductors. Each conductor has a diameter of 1.25 inches. If the length of the transmission line is 120 km, calculate the shunt admittance to neutral of the line.
 A. 4.6×10^{-3} siemens B. 4.6×10^{-4} siemens C. 4.6×10^{-5} siemens D. 4.6×10^{-6} siemens
85. The core of a certain magnetic circuit has a length of 5 cm and the inductance of the coil is 10 mH. What is the inductance of the same if the number of turns is reduced to one half of the original? All other factors are unchanged.
 A. 2.5 mH B. 5 mH C. 10 mH D. 20 mH
86. A 5 MVA, 13.8/0.48 KV, 5% impedance transformer is tapped at 13.8 kV line where the Thevenin's equivalent impedance is 0.5 ohm. Determine the fault current at the primary for a three-phase fault at the secondary.
 A. 10,500 A B. 4,200 A C. 6,050 A D. 3,300 A
87. What is the annual capacity factor of the plant if the annual energy produced in a 150 MW power plant is $500 \times 10^6 \text{ KWHR}$?
 A. 34 % B. 44 % C. 38 % 38% D. 57 %

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88. A 230 V DC series motor is connected to 230 V AC. It will _____.
A. run faster
B. run slowly
C. run with less efficiency
D. not run at all
89. The three-phase, three-wire, 240 V, ABC system supplies power to a wye connected load with impedances of $Z_a=Z_b= 25 \angle 0^\circ \Omega$, and $Z_c=20 \angle 0^\circ \Omega$. Find the total power.
A. 1,563 W
B. 2,880 W
C. 2,496 W
D. 1,883 W
90. The net energy required for a certain country in year 2010 was approximately 3×10^6 GWHR. What is the equivalent of this energy in quad?
A. 12.10
B. 42.10
C. 21.40
D. 10.24
91. A 42 kW, 400 V dc shunt motor has a rated armature current of 100 A at 1,500 rpm. The resistance of the armature is 0.2 ohm. Find the internal torque developed.
A. 224 N-m
B. 240 N-m
C. 204 N-m
D. 242 N-m
92. This is the device function number for DC power circuit breaker.
A. 52
B. 72
C. 82
D. 92
93. A pulsating direct current has a constant magnitude of 9 A for 0.02 sec and is 0 for 0.01 sec. The cycle is then repeated. What is its effective value?
A. 7.35 A
B. 54.17 A
C. 3 A
D. 81 A
94. A certain copper wire has a resistance of 0.5 Ω when the length is 10 m. What is its diameter in mils?
A. 26
B. 21
C. 38
D. 33
95. Three 30:1 step-down transformers are connected Y- Δ for stepping down the 132,000-volt three phase transmission voltage. Calculate the secondary line voltage.
A. 4,400 V
B. 2,540 V
C. 7,621 V
D. 24,100 V
96. A 3 ϕ synchronous motor runs at full-load speed of 1,200 rpm. If the load is reduced to one-half of rated, calculate its speed regulation.
A. 100 %
B. 50%
C. 0 %
D. 86.6%
97. A magnetic circuit consists of silicon steel 3,000 permeability of 10 cm length and cross-section of 1.5 square cm and an air gap of the same cross-section and of 2 cm length. A 0.5 ampere current flows through 500 turns. What is the field intensity at the air gap?
A. 250 Oersted
B. 156.7 Oersted
C. 795.6 Oersted
D. 2,262 Oersted
98. A short 3 ϕ line with an impedance of $6 + j8 \Omega$ per line has sending and receiving end line voltages of 120 and 110 kV respectively for some receiving end load at a power factor of 0.9 lagging. What is the active power at the receiving end of the line?
A. 120,200 kW
B. 110,200 kW
C. 100,200 kW
D. 90,200 kW
99. If a half-wave rectifier is used with 117-v rms ac (house mains), the average dc output voltage is about _____.
A. 52.7 V
B. 105.4 V
C. 82.7 V
D. 165.4 V
100. A wind generator with an efficiency of 0.85 has a blade diameter of 20 m. If the wind velocity is 30 km/hr, how much power is obtainable from the generator?
A. 53.4 kW
B. 75.4 kW
C. 68.6 kW
D. 58.3 kW

*** END ***

SUBMIT THIS TEST QUESTION SET TOGETHER WITH THE ANSWER SHEET TO YOUR WATCHERS. BRINGING THE TEST QUESTION SET OUT OF THE ROOM WILL BE A GROUND FOR DISCIPLINARY ACTION