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PACIFIC GAS AND ELECTRIC COMPANY

PG&E — 245 MARKET STREET · SAN FRANCISCO, CALIFORNIA 94106 · TELEPHONE 781-4211

October 5, 1965

Local Union No. 1245
International Brotherhood of
Electrical Workers, AFL-CIO
1918 Grove Street
Oakland 12, California

Attention: Mr. Ronald T. Weakley, Business Manager

Gentlemen:

As discussed in the August 27, 1965 meeting of the Apprenticeship Committee, it is proposed that Company and Union establish the attached test to determine employees' qualifications for promotion to vacancies in any of the Electrician classifications under the provisions of Section 205.11 of the Agreement.

Company proposes to select the successful bidder in the normal application of Title 205 and test such successful bidder. If the test program results in his failure, his bid will be rejected and the next employee in order will be tested. This procedure will continue until the employee tested meets the test requirement.

A score of 70 points will be necessary to meet this test requirement.

This agreement shall be effective in filling vacancies posted on November 1, 1965, and thereafter, and may be terminated 30 days after notice in writing is given by either party to the other.

If you are in accord with the foregoing proposals and attachment and agree thereto, please so indicate in the space provided below and reutn one executed copy of this letter to Company.

Yours very truly,

PACIFIC GAS AND ELECTRIC COMPANY

By _____
Manager of Industrial Relations

The Union is in accord with the foregoing and it agrees thereto as of the date hereof.

LOCAL UNION NO. 1245, INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS, AFL-CIO

October 8, 1965

By Ronald T. Weakley
Business Manager

62-6217

No. _____

EXAMINATION FOR DETERMINING EMPLOYEES' QUALIFICATIONS FOR JOURNEYMAN ELECTRICIAN CLASSIFICATION

NAME _____

DATE _____

DIVISION _____

CLASSIFICATION _____

TIME START _____ FINISH _____

INSTRUCTIONS

1. You will be allowed a maximum of 3-1/2 hours to complete this examination.
2. All written calculations should be made in the space provided. All answers should be underlined, circled or otherwise clearly marked so that it is readily understood what the answers are intended to be.
3. This is a "closed book" examination and use of reference material is not permitted.
4. There are 100 points available in the examination and 70 points are required as a passing score.
5. Each question is worth 1 point unless marked otherwise.
6. Be certain that this sheet is attached to your examination when it is turned in.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO PROCEED

Series C

PACIFIC GAS AND ELECTRIC COMPANY
ELECTRIC OPERATIONS

1. An electric heater whose coil is wound with No. 18 iron wire is connected across 110 volts. If it draws a current of 10 amps, what is its value of resistance?

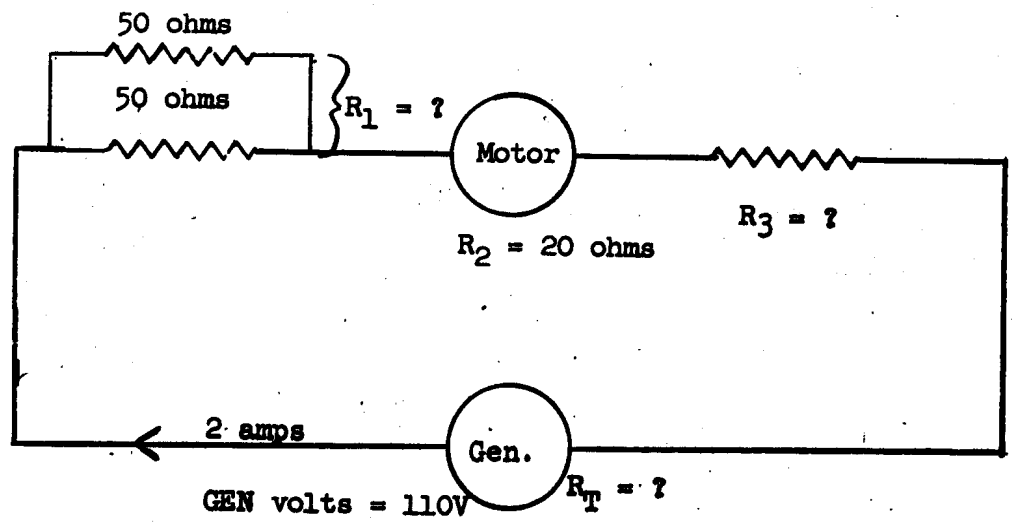
2. A D-C bus has 300 amps flowing through it and has voltage drop of 1.2 volts. What is the resistance of the bus?

3. What is the bias voltage developed across a grid leak resistor of 2 MEG ohms if the current through it is 0.0000002 amp?

4. In a series circuit, the total voltage is equal to the total current multiplied by the _____.

2 (2 Points)

5. In the following diagram solve for R_1, R_3, and R_T

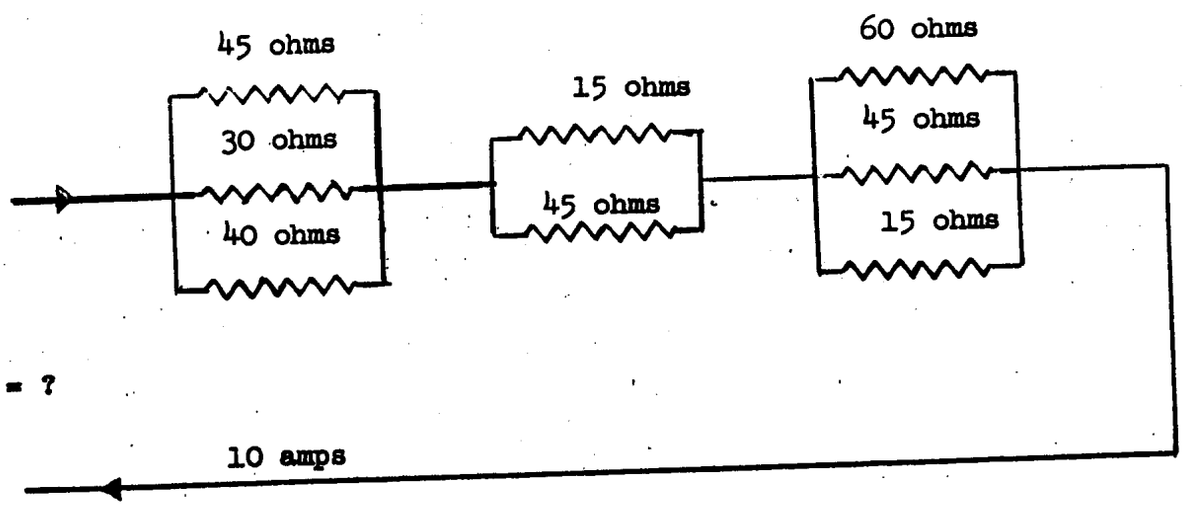


6. Reduce to the lowest terms: $1/3 + 1/6 + 1/9$

7. Solve for R in the following: $\frac{2R}{3} = \frac{9}{4}$

(3 Points)

8. Find the total resistance in the diagram below:



(2 Points)

9. In tracing the control circuits of an oil circuit breaker, you find wires labeled 5, 7, and 9. What do these numbers indicate?

10. What instrument is most frequently used to measure the insulation resistance of electrical equipment?

(3 Points)

11. When testing a new transformer bank which has a tertiary winding connected in delta, a corner of the delta is usually left open when the bank is first energized for the first time. Why is this done?

(3 Points)

12. A voltage regulator was found to be in the full buck position with the controls on "AUTO" on a circuit that had low voltage complaints. List three troubles that could cause the above condition.

(2 Points)
13. What would an induction regulator do if it were not equipped with a brake?

(2 Points)
14. A distribution feeder circuit equipped with automatic reclosing should complete its reclosing operations in less than _____ seconds, and lockout in _____ seconds.

(2 Points)
15. What methods may be used to determine the power-factor of a circuit?

(2 Points)
16. Which one or more of the following statements apply to overcurrent relays? Circle correct answer or answers.

(a) The tap setting is the relay current necessary to just cause the disc to rotate until contacts close.

(b) The permanent magnets aid the disc to move.

(c) The target is actuated by tripping current.

(d) The instantaneous element is an induction disc.

(2 Points)
17. Which one or more of the following statements describe a part of the purpose of a tailboard briefing? Circle correct answer or answers.

(a) Tailboard briefings are carried on only by crews consisting of four or more employees.

(b) Each man will understand the hazards or trouble spots involved.

(c) Each man will understand what he is to do.

(d) Each man will understand the purpose of the job.

(2 Points)

18. The basic equation for figuring transformer ratio is $\frac{E_p}{E_s} = \frac{N_p}{N_s}$

Circle the correct answer or answers below.

(a) $E_p = \frac{E_s N_s}{N_p}$

(b) $E_s = \frac{E_p N_s}{N_p}$

(c) $E_p N_s = E_s N_p$

(d) $N_p N_s = E_p E_s$

(2 Points)

19. Which one or more of the following are true statements concerning control wiring? Circle the correct answer or answers.

(a) Wires numbered 4, 6, and 8 should be potential wires.

(b) Wire numbered 3 should be current circuit wire.

(c) Wire numbered 1 should be the opening wire.

(d) Wire numbered 1 should be the closing wire.

(2 Points)

20. Which one or more of the following are true statements concerning the automatic operation of a OCB to test a line?
Circle the correct answer or answers.

(a) OCB is open.

(b) OCB is closed.

(c) Line is de-energized.

(d) Bus is energized.

(2 Points)
21. State "OHMS Law" for AC circuits?

(2 Points)
22. When a transformer is to be banked with others, what information is necessary to determine if this can be done safely?

(2 Points)
23. Make a sketch of a transformer, using standard symbols, show the polarity to be subtractive.

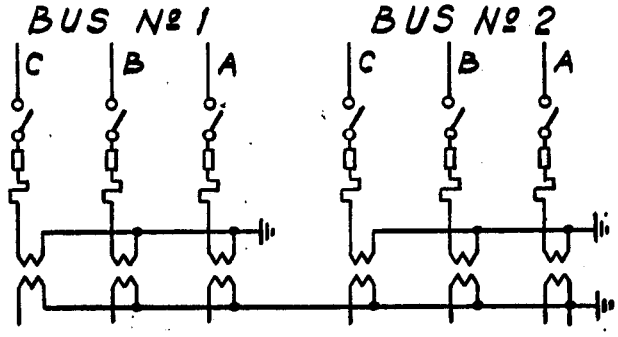
(2 Points)
24. A certain transformer has a rating of 500 KVA at 12 KV and 41.67 amperes. If 3 transformers of the above rating are connected Delta, what would be the rated line current of the bank?

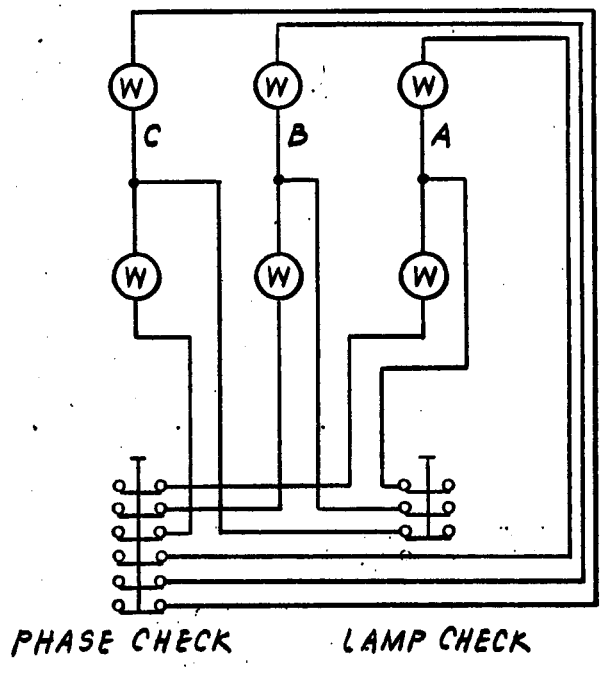
25. What is the function of transil oil in a transformer?

26. What is the purpose of the tertiary winding of a transformer?

3(30 Points)

27. In the diagram below complete the circuitry so the phasing panel will work.





2(2 Points)

28. What should be the voltage of a megger used on control wire?

1(2 Points)

29. If you have watts and vars flowing in the same direction is the power factor lead or lag?

30. If an OCB is open, is the "b" seal open or closed?

3 (3 Points)
31. A distribution circuit has ammeters on it that read:
A phase = 90 amps, B phase = 106 amps and C phase = 145 amps.

From these readings can you tell what residual current is flowing? Why?

3 (3 Points)
32. Draw a simple diagram of a D-C bus with a battery ground indicator.

(2 Points)
33. If you have two 10 watt resistors in parallel what is the maximum wattage that can be dissipated in the two resistors?

If they are in series?

34. What is a bridge rectifier circuit used for? BRIDGE CIRCUIT

(2 Points)
35. What are the three main parts of a triode vacuum tube?

(2 Points)
36. What is the impedance of circuit having 6 ohms reactance and 8 ohms resistance?

(3 Points)
37. What is the cardinal rule concerning current transformer secondary circuits? Why?

(2 Points)
38. In making over-all ratio tests where should the secondary current readings be taken?

(2 Points)
39. How does frequency effect the inductive and capacitive reactance of a circuit?

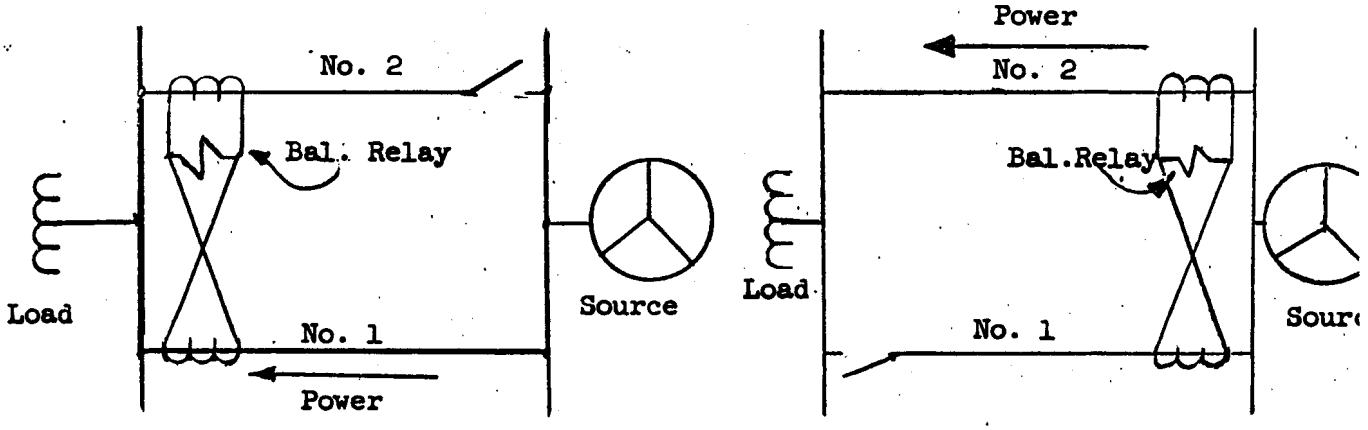
(2 Points)
40. If the capcitance is cut in half what happens to the capacitive reactance of the circuit?

41. What is the normal floating voltage for a 60 cell station battery?

(2 Points)
42. In Class A amplification, plate current flows during _____ degrees of the input cycle. How many degrees in Class B operation? _____

3 (3 Points)
43. Draw a diagram of three overcurrent relays and a ground relay. Show current transformers and polarity marks.

(3 Points)
44. For the load conditions shown, which line should the balance relay tend to trip?



(3 Points)
45. Given a directional relay connection such that maximum torque occurs when the current lags its unity power factor by 45 degrees, for the following conditions should the directional element be open or closed?

(a) Power in trip direction, power factor angle 50 degree lead. Contact open or closed?

(b) Power in trip direction power factor angle 0 degrees. Contact open or closed?

(2 Points)
46 Name the type of motor most commonly used to drive power industrial equipment and state why the type is used?

(2 Points)
47. What must be done first before removing any bolts on inspection doors or plates allowing access to the bushing box or other opening into a generator or condensor?

(2 Points) 5

48. Motor circuits are equipped with "instantaneous" and "time" over-current protection. What is the purpose of each of these overcurrent features?

(3 Points)

49. By means of a simple diagram show three single phase transformer rated at 12,000 to 2,400 volts, connected to a 12,000 volt, 3 phase line to supply a 4,160 volt 3 phase load.

(3 Points)

50. Give the numerical values of the Sin A, Cos A and Tan A in the triangle below.

Sin A =

Cos A =

Tan A =