

Electricity II

024

Friday, 04 Nov 2011 8.30-11.30 AM

WORKFORCE DEVELOPMENT AUTHORITY



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ADVANCED LEVEL NATIONAL EXAMINATIONS 2011 PROFESSIONAL AND TECHNICAL OPTIONS

SUBJECT: ELECTRICITY II

**OPTION: ELECTRONICS&TELECOMMUNICATION (ETL)
COMPUTER ELECTRONICS (CEL)**

DURATION: 3HOURS

INSTRUCTIONS:

This paper consists of three sections: **A, B** and **C**.

Section A: Answer **all** the questions. (55marks)

Section B: Answer **three** questions of your choice. (30marks)

Section C: Answer **only one** question of your choice. (15marks)

Use of scientific calculator is accepted.

Section A: Answer all the questions. (55marks)

01. What are the causes of fault starting of a synchronous motor? (5marks)
02. Two capacitors have capacitances of $5\mu\text{F}$ and $10\mu\text{F}$ respectively
(i) find the total capacitance when they are connected: (1°) in parallel, (2°) in series;
(ii) When the above two capacitors are connected in series across a 220V supply, find the potential difference across each capacitor (4marks)
03. Which factors causes variations in the terminal voltage of an alternator when loaded? (3marks)
04. A conductor 20cm long and carrying a current of 30A lies perpendicular to a field of strength 1000AT/m. Calculate: (4marks)
(i) the force acting on the conductor
(ii) the mechanical power to move this conductor against this force with a speed of 1m/s
(iii) e.m.f induced in the conductor
05. A motor stops after starting i.e, it fails to call load. What could be the causes? (4marks)
06. What is the procedure for shutting down a generator? (3marks)
07. A coil of resistance 200huss inductance 0.1H is connected in series with a capacitor of capacitance $150\mu\text{F}$ across a 220V, 50Hz supply. Determine: (7.5marks)
(i) Impedance, (ii) current (iii) power factor (iv) Voltage across the coil
(v) voltage across the capacitor
08. A circuit having a resistance of 8Ω and inductance of 0.5H and a variable capacitance in series is connected across 200V, 50Hz supply. Calculate:
(i) the capacitance to give resonance
(ii) the voltage across inductance and capacitance (4.5marks)
09. What will happen if the field of a.d.c motor is opened (1mark)
10. Basically what does an alternator consists of? (2marks)
11. A shaded-pole motor is found to develop less power but gets too hot. Reason? (3marks)
12. If a 6-pole motor running from a 50Hz supply has an e.m.f in the rotor of frequency 2.5Hz, determine: (i) the slip (3marks)
(ii) the speed of the motor

13. In a 25KVA, 6600/460V, 1-phase transformer, the iron and full-load copper losses are respectively 350W and 400W.
Calculate: (i) the efficiency at half-load 0.8p.f (5marks)
(ii) the load at which the efficiency is maximum
14. A three-phase induction motor is wound for 4poles and is supplied from a 50Hz system.
Calculate: (i) the synchronous speed (4marks)
(ii) the speed of the rotor when the slip is 4 percent;
(iii) the rotor frequency when speed of the rotor is 700 r.p.m;
15. Three similar resistors are connected in star across 380V, 3-phase lines. The line current is 6A.
a) Calculate the value of each resistor
b) To what value should the line voltage be changed to obtain the same line current with the resistors delta-connected? (2marks)

Section B: Answer three questions of your choice. (30marks)

16. Shunt generator delivers 95A at a terminal p.d of 250V. The armature resistance and shunt field resistance are 0.02Ω and 50Ω respectively. The iron and friction losses equal 950w. (10marks)
Find: (i) e.m.f generated
(ii) Cu losses
(iii) output of the prime mover in KW
(iv) commercial, mechanical and electrical efficiencies
17. A 25KVA, 2200/110V transformer has $R_1=3.45\Omega$, $R_2=0.009\Omega$. The values of reactances are $X_1=5.2\Omega$ and $X_2=0.015\Omega$.
Calculate for the transformer: (10marks)
(i) Equivalent resistance as referred to primary
(ii) Equivalent resistance as referred to secondary
(iii) Equivalent resistance as referred to both primary and secondary
(iv) Equivalent impedance as referred to both primary and secondary
(v) Total Cu losses, first using individual resistance of the two windings and secondly using equivalent resistances as referred to each side

18. Two coils A and B are connected in series across a 480V, 50Hz supply. The resistance of A is 10Ω and the inductance of B is 0.05H. if the input from supply is 6Kw and 4KVAR, find the inductance of A and the resistance of B.

Calculate the voltage across each coil (10marks)

19. Give the comparison of shunt motors and series motors. (10marks)

20. Three similar coils, each of resistance 10Ω and inductance 0.5H are connected
(a) in star,
(b) in delta to a 3-phases, 50Hz, 380V (between lines) supply

Calculate the line current and total power absorbed (10marks)

Section C: Answer only one question of your choice. (15marks)

21. A 120Kw, 360V shunt generator was run as a motor on no-load at its rated voltage and speed. The total current taken was 9.8A including a shunt current of 2.7A .The resistance of the armature circuit at normal working temperature was 0.11Ω . Calculate the efficiencies at :

(a) full-load and (b) half-load (15marks)

22. Mention and explain the various causes for the failure of the generator to build up (to excite) (15marks)

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