

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENGAJIAN TINGGI**

JABATAN KEJURUTERAAN AWAM

PENILAIAN ALTERNATIF

SESI 1: 2021/2022

**DCB30082 : ELECTRICAL MACHINES & TELECOMMUNICATION
SYSTEM**

NAMA PENYELARAS KURSUS : JAMILAH BINTI HJ ABBAS

KAEDAH PENILAIAN : PEPERIKSAAN ATAS TALIAN

**JENIS PENILAIAN : SOALAN BERSTRUKTUR & ESEI
(3 SOALAN)**

TARIKH PENILAIAN : 26 JANUARI 2022

TEMPOH PENILAIAN : 1 JAM 30 MINIT

LARANGAN TERHADAP PLAGIARISM (AKTA 174)

**PELAJAR TIDAK BOLEH MEMPLAGIAT APA-APA IDEA, PENULISAN, DATA
ATAU CIPTAAN ORANG LAIN. PLAGIAT ADALAH SALAH SATU
PENYELEWENGAN AKADEMIK. SEKIRANYA PELAJAR DIBUKTIKAN
MELAKUKAN PLAGIARISM, PENILAIAN BAGI KURSUS BERKENAAN AKAN
DIMANSUHKAN DAN DIBERI GRED F DENGAN NILAI MATA 0.**

**(RUJUK BUKU ARAHAN-ARAHAN PEPERIKSAAN DAN KAEDAH PENILAIAN (Diploma) EDISI 6, JUN 2019,
KLAUSA 17.3)**

SECTION A : 50 MARKS
BAHAGIAN A : 50 MARKAH**INSTRUCTION:**

This section consists of **TWO (2)** structured questions. Answer ALL question.

ARAHAN :

Bahagian ini mengandungi DUA (2) soalan berstruktur. Jawab SEMUA soalan.

QUESTION 1**SOALAN 1**CLO 2
C2

- a) A 10 brake horse power (B.H.P) d.c shunt motor is connected with 250 volt supply. Its efficiency is 93%. Estimate the motor current. [5 marks]
- Motor medan pirau arus terus 10 kuasa kuda brek disambungkan kepada bekalan voltan 250 V. Kecekapan motor ini ialah 93%. Anggarkan arus motor tersebut*
- [5 markah]

CLO2
C3

- b) A short shunt cumulative compound d.c generator supplies 7.5 kw at 230V. The shunt field, series field and armature resistances are 100, 0.3 and 0.4 ohms respectively. Calculate the induced e.m.f [8 marks]
- Penjana medan majmuk pendek membekalkan 7.5 kw pada voltan 230. Jumlah rintangan medan pirau, medan siri dan rintangan angker masing-masing 100, 0.3 dan 0.4 ohms. Kirakan daya gerak elektrik terjana.*
- [8 markah]

CLO2
C3

- c) A d.c shunt wound generator supplies a load current of 15 A at 220V. If the resistance of armature is 0.4 ohms and shunt field is 110 ohms, calculate :
- Penjana medan pirau arus terus membekalkan arus bekalan 15A pada 220V. Jika rintangan angker 0.4 ohm dan rintangan medan pirau 110 ohm, kirakan :*

- i. The e.m.f generated [6 marks]
Daya gerak elektrik terjana [6 markah]
- ii. Total copper losses in the generator [6 marks]
Jumlah kehilangan kuprum dalam penjana. [6 markah]

QUESTION 2**SOALAN 2**CLO2
C2

- a) A 6 pole AC generator is running and producing the frequency of 50 Hz, estimate the r.p.m of generator. [5 marks]
Penjana arus ulang alik 6 kutub sedang berjalan dan menghasilkan frekuensi 50Hz, anggarkan p.s.m penjana ini. [5 markah]

CLO2
C3

- b) The power input to a 3 phase induction motor is 60 kW. The stator loses a total 1.5 kW, calculate the total mechanical power developed if the motor is running with a slip of 4% [8 marks]
Kuasa input kepada motor aruhan 3 fasa ialah 60kW. Kehilangan stator sejumlah 1.5kW, kirakan jumlah kuasa mekanikal yang dibangunkan jika motor bergerak dengan gelinciran 4% [8 markah]

CLO2
C3

- c) In a 50 kVA transformer, the iron loss is 500 watts and the full load copper loss is 800 watts. Determine the efficiency at full load when power factor:
Sebuah alatubah 50kVA, mengalami kehilangan besi sebanyak 500 watts dan kehilangan penuh kuprum sebanyak 800 watt. Tentukan kecekapan alat ubah berbeban penuh bila faktor kuasa :
- i. Unity/ *Uniti* [6 marks]
- ii. 0.8 [6 marks]

SECTION B : 25 MARKS**BAHAGIAN B : 25 MARKAH****INSTRUCTION:**

This section consists of **ONE (1)** essay question. Answer **ONE (1)** question only

ARAHAN:

Bahagian ini mengandungi SATU (1) soalan esei. Jawab SATU (1) soalan sahaja

QUESTION 1**SOALAN 1**

- CLO1
C3
- a) Explain **THREE (3)** basic elements involving energy saving and efficiency.
[5 marks]
Terangkan TIGA (3) perkara asas yang melibatkan penjimatan tenaga.
[5 markah]
- CLO1
C3
- b) Power factor correction aims to improve power factor and therefore power quality.
Write **FIVE (5)** advantages of power factor improvement and correction.
[10 marks]
Pembetulan faktor kuasa bertujuan untuk meningkatkan factor kuasa dan kualiti kuasa. Tuliskan LIMA (5) kebaikan pembetulan factor kuasa
[10 markah]
- CLO1
C3
- c) Johan has built a bungalow. By using diagram, explain the electricity tariff rate imposed on the building.
[10 marks]
Johan telah membina sebuah banglo. Dengan bantuan gambarajah, terangkan kadar tarif elektrik yang dikenakan terhadap bangunan tersebut
[10 markah]

SOALAN TAMAT

FORMULA

DC generator

$$E_g = \frac{\phi Z N}{60} \times \frac{P}{A}$$

$$\eta = \frac{VI_L}{VI_L + \text{losses}} \times 100\%$$

Shunt wound generator

$$I_{sh} = \frac{V}{R_{sh}}$$

$$I_a = I_L + I_{sh}$$

$$E_g = V + I_a (R_a)$$

$$P_a = E_g I_a$$

$$P_L = VI_L$$

$$P_c = I_a^2 R_a + V.I_{sh}$$

Series wound generator

$$I_a = I_L = I_{se} = I$$

$$E_g = V + I_a (R_a) + I_{se} (R_{se})$$

Short shunt compound generator

$$I_{se} = I_L$$

$$I_a = I_L + I_{sh}$$

$$I_{sh} = \frac{V + I_{se} R_{se}}{R_{sh}}$$

$$E_g = V + I_a (R_a) + I_{se} (R_{se})$$

Long shunt compound generator

$$I_{se} = I_a = I_L + I_{sh}$$

$$I_{sh} = \frac{V}{R_{sh}}$$

$$E_g = V + I_a (R_a) + I_{se} (R_{se})$$

Losses

$$P_c = I_a^2 R_a + V.I_{sh} \text{ (shunt)}$$

$$P_c = I_a^2 R_a + I_{se}^2 R_{se} + V.I_{sh} \text{ (compound)}$$

$$\text{Total losses} = P_{in} - P_{out}$$

DC motor

$$E_b = \frac{P \phi N Z}{60 A}$$

$$T_a = 0.159 \phi Z P \times \frac{I_a}{A}$$

$$T_a = 9.55 \times \frac{E_b I_a}{N}$$

$$F = BLI$$

$$\eta = \frac{VI_L - \text{losses}}{VI_L} \times 100\%$$

Shunt wound motor

$$E_b = V - I_a R_a$$

$$I_L = I_a + I_{sh}$$

$$I_{sh} = \frac{V}{R_{sh}}$$

$$N1/N2 = E_{b1}/E_{b2}$$

Series wound motor

$$I_a = I_L = I_{se} = I$$

$$E_b = V - I(R_a + R_{se})$$

$$N1/N2 = E_{b1}/E_{b2} \text{ (}\phi_1/\phi_2\text{)}$$

Short shunt compound motor

$$I_{se} = I_L$$

$$I_L = I_a + I_{sh}$$

$$I_{sh} = \frac{E_b}{R_{sh}}$$

$$E_b = V - I_{se} R_{se} - I_a R_a$$

Long shunt compound motor

$$I_{se} = I_a$$

$$I_{sh} = \frac{V}{R_{sh}}$$

$$I_L = I_a + I_{sh}$$

$$E_b = V - I_a (R_a + R_{se})$$

AC generator

$$f = \frac{NP}{120}$$

$$K_d = \frac{\sin\left(\frac{m\beta}{2}\right)}{m \sin\left(\frac{\beta}{2}\right)}$$

$$K_p = \cos\left(\frac{\alpha}{2}\right)$$

$$E_{ph} = 2.22 K_p K_d Z f \phi$$

$$E_{line} = \sqrt{3} E_{ph}$$

$$E_{line} = E_{ph}$$

AC motor

$$N_s = \frac{120f}{P}$$

$$s = \frac{N_s - N_r}{N_s} \times 100\%$$

$$N_r = N_s (1 - s)$$

$$f_r = sf$$

$$\text{Mechanical power} = (1 - S) \times \text{rotor input}$$

Transformer

$$\frac{E_1}{E_2} = \frac{N_1}{N_2} = \frac{I_2}{I_1}$$

$$E = 4.44 f N \phi_m$$

$$\eta_{FL} = \frac{(VA \times p.f)}{(VA \times p.f) + \text{IL} + \text{CL}} \times 100\%$$

$$\eta_{1/2FL} = \frac{\left(\frac{1}{2} VA \times p.f\right)}{\left(\frac{1}{2} VA \times p.f\right) + \text{IL} + \left(\frac{1}{2}\right)^2 \text{CL}} \times 100\%$$