



FINAL EXAMINATION / PEPERIKSAAN AKHIR
SEMESTER 2 – SESSION 2015 / 2016
PROGRAM KERJASAMA

COURSE CODE : DDPK 2133
KOD KURSUS

COURSE NAME : ELECTRICAL MACHINES AND DRIVES /
NAMA KURSUS MESIN ELEKTRIK DAN PEMACU

YEAR / PROGRAMME : 2 DDPB
TAHUN / PROGRAM

DURATION : 2 HOURS 30 MINUTES / 2 JAM 30 MINIT
TEMPOH

DATE : APRIL 2016
TARIKH

INSTRUCTION/ARAHAN :

1. Answer **ALL** questions in the answer booklet(s) provided.
Jawab **SEMUA** soalan di dalam buku jawapan yang disediakan.

(You are required to write your name and your lecturer's name on your answer script)
(Pelajar dikehendaki tuliskan nama dan nama pensyarah pada skrip jawapan)

NAME / NAMA	:
I.C NO. / NO. K/PENGENALAN	:
YEAR / COURSE TAHUN / KURSUS	:
COLLEGE'S NAME NAMA KOLEJ	:
LECTURER'S NAME NAMA PENSYARAH	:

This examination paper consists of ...7... pages including the cover
Kertas soalan ini mengandungi7..... muka surat termasuk kulit hadapan

Q1. (a) Referring to Figure Q1(a), state the basic rules governing diode behavior.

Merujuk kepada Rajah Q1(a), nyatakan peraturan asas mengenai perlakuan diod.

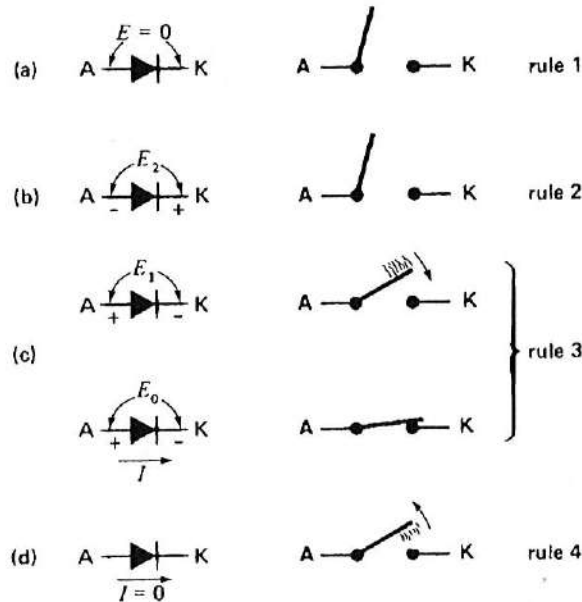


Figure Q1(a) / Rajah Q1(a)

(10 marks / markah)

(b) Figure Q1(b) shows a thyristor and a resistor are connected in series across an ac source. A number of short pulses E_g is applied to the gate of sufficient amplitude to initiate conduction provided the anode is positive. Referring to Figure Q1(c), the gate pulses occur at angle $\theta_1, \theta_2, \theta_3, \theta_4$ and θ_5 . Explain how the circuit reacts to these pulses.

Rajah Q1(b) menunjukkan satu tiristor dan satu perintang disambung sesiri melintang suatu bekalan au. Beberapa bilangan dedenyut ringkas E_g dikenakan kepada get dengan amplitud berpadanan untuk memulakan pengaliran dengan syarat anod adalah positif. Merujuk kepada Rajah Q1(c), dedenyut get berlaku pada sudut $\theta_1, \theta_2, \theta_3, \theta_4$ dan θ_5 . Terangkan bagaimana tindakbalas litar terhadap dedenyut tersebut.

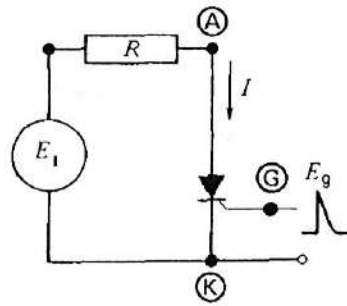


Figure Q1(b) / Rajah Q1(b)

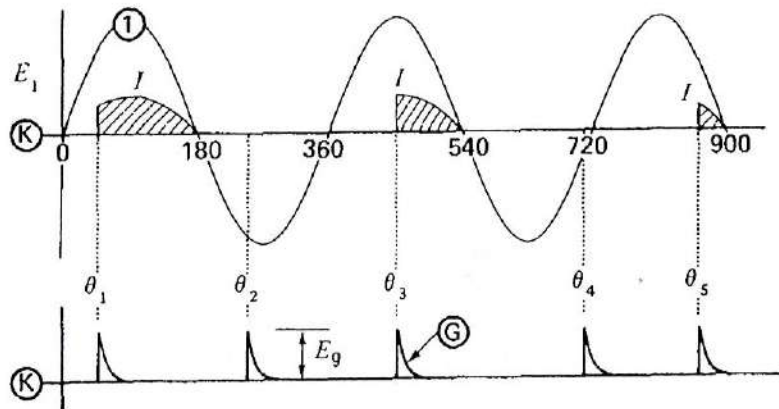


Figure Q1(c) / Rajah Q1(c)

(15 marks / markah)

- Q2. (a) With the aid of a diagram, describe the basic principles of operation of a single-phase bridge rectifier **or** a three-phase bridge rectifier.

*Dengan bantuan gambar rajah, terangkan prinsip asas kendalian penerus tetimbang satu-fasa **atau** penerus tetimbang tiga-fasa.*

(10 marks / markah)

- (b) A three-phase bridge rectifier has to supply power to a 360 kW, 240 V dc load. If a 600 V, 60 Hz three-phase feeder is available, calculate the following :-
- (i) voltage rating of the three-phase transformer.
 - (ii) dc current of each diode.
 - (iii) peak inverse voltage across each diode.
 - (iv) peak-to-peak ripple in the output voltage and its frequency.

Suatu penerus tetimbang tiga fasa membekalkan kuasa kepada suatu beban at 360 kW, 240 V. Jika didapati penyuar tiga fasa 600 V, 60 Hz, kirakan yang berikut :-

- (i) kadaran voltan pengubah tiga fasa.*
- (ii) arus at setiap diod.*
- (iii) voltan balikan puncak merintanggi setiap diod.*
- (iv) riak puncak ke puncak pada voltan keluaran dan frekuensinya.*

(15 marks / markah)

- Q3. (a) There are two types of chopper control methods which are the power control or motoring control and the regenerative-braking control. Explain any one (1) of the control methods.

Terdapat dua jenis kaedah kawalan pemenggal iaitu kawalan kuasa atau kawalan pemotoran dan kawalan pemberhentian jana semula. Jelaskan salah satu (1) daripada kaedah kawalan tersebut.

(7.5 marks / markah)

- (b) High speed reliable and inexpensive semiconductor devices have produced a dramatic change in the control of dc motor. With this two conditions, list the steps to be taken when field reversal or armature reversal is employed.

Peranti separa pengalir keboleharapan kelajuan tinggi dan tidak mahal telah menghasilkan perubahan dramatik dalam pengawalan motor at. Dengan mengambil kira dua syarat tersebut, senaraikan langkah-langkah yang perlu diambil apabila balikan medan atau balikan angker digunakan.

(7.5 marks / markah)

- (c) A separately excited dc motor operating from a single-phase half controlled bridge at a speed of 1500 rpm has an input voltage of $300 \sin 314t$ V and a back emf of 80 V. The SCRs are fired symmetrically at $\alpha = 30^\circ$ in every half cycle and the armature has a resistance of 5Ω . Calculate the average armature current and the motor torque.

Suatu motor at ujaan berasingan berkendali dari tetimbang separuh kawalan satu fasa pada kelajuan 1500 ppm dan mempunyai voltan masukan $300 \sin 314t$ V dan dge balikan 80 V. SCR dikenakan tembakan secara simetri ketika $\alpha = 30^\circ$ pada setiap separuh kitar dan angker mempunyai rintangan sebanyak 5Ω . Kirakan arus angker purata dan dayakilas motor.

(10 marks / markah)

- Q4. (a) State the advantages and disadvantages of ac drives to dc drives.

Nyatakan kebaikan dan keburukan pemacu au terhadap pemacu at.

(7.5 marks / markah)

- (b) In general, there are two types of ac drives which are induction motor drives and synchronous motor drives. Explain any one (1) of the ac drives.

Secara umum, terdapat dua jenis pemacu ac iaitu pemacu motor aruhan dan pemacu motor segerak. Jelaskan salah satu (1) daripada pemacu au tersebut.

(7.5 marks / markah)

- (c) A three-phase, 400 V, 20 kW, 970 rpm, 50 Hz delta-connected induction motor has rotor leakage impedance of $(0.5 + j2.0) \Omega$. Stator leakage impedance and rotational

losses are neglected. If this motor is energized from 400 V, 90 Hz, three-phase source, calculate :-

- (i) the motor speed at rated load.
- (ii) the slip at which maximum torque occur.
- (iii) the maximum torque.

Motor aruhan tiga fasa sambungan delta 400 V, 20 kW, 970 ppm, 50 Hz mempunyai galangan kebocoran rotor $(0.5 + j2.0) \Omega$. Galangan kebocoran stator dan kehilangan putaran diabaikan. Jika motor tersebut dijanakan dari bekalan tiga fasa 400 V, 90 Hz, kirakan :-

- (i) *kelajuan motor ketika beban terkadar.*
- (ii) *kegelinciran ketika dayakilas maksimum berlaku.*
- (iii) *dayakilas maksimum.*

(10 marks / markah)