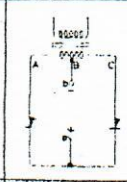
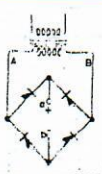
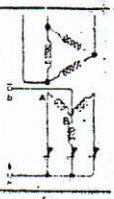
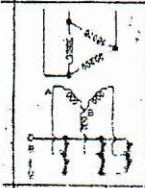
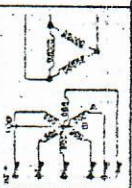
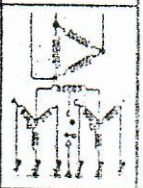
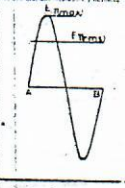
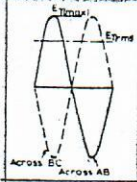
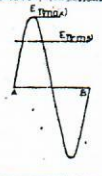
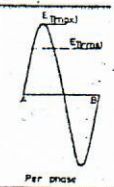
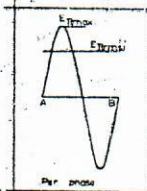
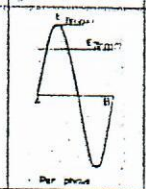
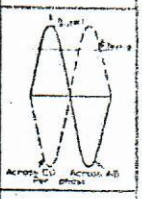
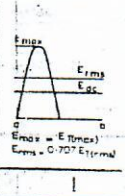
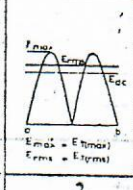
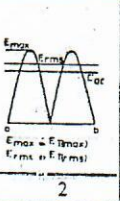
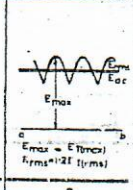
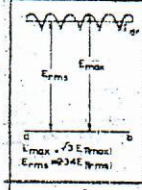
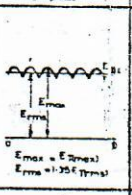
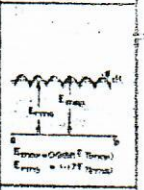
TABLE 1

IDEALISED RECTIFIER CIRCUIT PERFORMANCES

	Single-Phase			Three-Phase			
	Half-Wave	Centre-Tap Full-Wave	Full-Wave Bridge	Half-Wave	Full-Wave Bridge	Centre-Tap	Double-Star
Type of rectifier circuit							
Secondary input voltage per phase							
Output voltage across a-b							
Number of Output Voltage Pulses per Cycle (N)	1	2	2	3	6	6	6
OUTPUT VOLTAGE	1	2	3	4	5	6	7
E_{dc} in terms of r.m.s. Input Voltage per Phase $E_{T(rms)}$	$0{\cdot}45E_{T(rms)}$	$0{\cdot}90E_{T(rms)}$	$0{\cdot}90E_{T(rms)}$	$1{\cdot}17E_{T(rms)}$	$2{\cdot}34E_{T(rms)}$	$1{\cdot}35E_{T(rms)}$	$1{\cdot}17E_{T(rms)}$
E_{dc} in terms of r.m.s. Output Voltage E_{rms}	$0{\cdot}636E_{rms}$	$0{\cdot}90E_{rms}$	$0{\cdot}90E_{rms}$	$0{\cdot}98E_{rms}$	E_{rms}	E_{rms}	E_{rms}
E_{dc} in terms of Peak Output Voltage E_{max}	$0{\cdot}318E_{max}$	$0{\cdot}636E_{max}$	$0{\cdot}636E_{max}$	$0{\cdot}826E_{max}$	$0{\cdot}955E_{max}$	$0{\cdot}955E_{max}$	$0{\cdot}955E_{max}$
R.M.S. Output Voltage E_{rms} in terms of E_{dc}	$1{\cdot}57E_{dc}$	$1{\cdot}11E_{dc}$	$1{\cdot}11E_{dc}$	$1{\cdot}02E_{dc}$	$1{\cdot}00E_{dc}$	$1{\cdot}00E_{dc}$	$1{\cdot}00E_{dc}$
Peak Output Voltage E_{max} in terms of E_{dc}	$3{\cdot}14E_{dc}$	$1{\cdot}57E_{dc}$	$1{\cdot}57E_{dc}$	$1{\cdot}21E_{dc}$	$1{\cdot}05E_{dc}$	$1{\cdot}05E_{dc}$	$1{\cdot}05E_{dc}$

OUTPUT CURRENT		1	2	3	4	5	6	7
Average Current per Rectifier Leg I_D		I_{dc}	$0{\cdot}5I_{dc}$	$0{\cdot}5I_{dc}$	$0{\cdot}33I_{dc}$	$0{\cdot}33I_{dc}$	$0{\cdot}167I_{dc}$	$0{\cdot}167I_{dc}$
I_{rms} per Rectifier Leg	R	$1{\cdot}57I_{dc}$	$0{\cdot}785I_{dc}$	$0{\cdot}785I_{dc}$	$0{\cdot}588I_{dc}$	$0{\cdot}577I_{dc}$	$0{\cdot}408I_{dc}$	$0{\cdot}293I_{dc}$
	L		$0{\cdot}707I_{dc}$	$0{\cdot}707I_{dc}$	$0{\cdot}577I_{dc}$	$0{\cdot}577I_{dc}$	$0{\cdot}408I_{dc}$	$0{\cdot}289I_{dc}$
I_{pk} per Rectifier Leg	R	$3{\cdot}14I_{dc}$	$1{\cdot}57I_{dc}$	$1{\cdot}57I_{dc}$	$1{\cdot}21I_{dc}$	$1{\cdot}05I_{dc}$	$1{\cdot}05I_{dc}$	$0{\cdot}525I_{dc}$
	L		I_{dc}	I_{dc}	I_{dc}	I_{dc}	I_{dc}	$0{\cdot}5I_{dc}$
TRANSFORMER RATING								
Secondary r.m.s. Voltage per Transformer Leg $E_{T(rms)}$		$2{\cdot}22E_{dc}$	$1{\cdot}11E_{dc}$ (to centre-tap)	$1{\cdot}11E_{dc}$ (total)	$0{\cdot}855E_{dc}$ (to neutral)	$0{\cdot}428E_{dc}$ (to neutral)	$0{\cdot}74E_{dc}$ (to neutral)	$0{\cdot}855E_{dc}$ (to neutral)
Secondary r.m.s. Current per Transformer Leg $I_{T(rms)}$	R	$1{\cdot}57I_{dc}$	$0{\cdot}785I_{dc}$	$1{\cdot}11I_{dc}$	$0{\cdot}588I_{dc}$	$0{\cdot}816I_{dc}$	$0{\cdot}408I_{dc}$	$0{\cdot}293I_{dc}$
	L		$0{\cdot}707I_{dc}$	I_{dc}	$0{\cdot}577I_{dc}$	$0{\cdot}816I_{dc}$	$0{\cdot}408I_{dc}$	$0{\cdot}289I_{dc}$
Secondary Volt-Amp VA_s	R	$3{\cdot}48E_{dc}.I_{dc}$	$1{\cdot}74E_{dc}.I_{dc}$	$1{\cdot}23E_{dc}.I_{dc}$	$1{\cdot}50E_{dc}.I_{dc}$	$1{\cdot}05E_{dc}.I_{dc}$	$1{\cdot}81E_{dc}.I_{dc}$	$1{\cdot}50E_{dc}.I_{dc}$
	L		$1{\cdot}57E_{dc}.I_{dc}$	$1{\cdot}11E_{dc}.I_{dc}$	$1{\cdot}48E_{dc}.I_{dc}$	$1{\cdot}05E_{dc}.I_{dc}$	$1{\cdot}81E_{dc}.I_{dc}$	$1{\cdot}48E_{dc}.I_{dc}$
Secondary Utility Factor U_s	R	0·287	0·574	0·813	0·666	0·95	0·552	0·666
	L		0·636	0·90	0·675	0·95	0·552	0·675
Primary Voltage per Transformer Leg (Transformer Ratio 1:1)		$2{\cdot}22E_{dc}$	$1{\cdot}11E_{dc}$	$1{\cdot}11E_{dc}$	$0{\cdot}855E_{dc}$	$0{\cdot}428E_{dc}$	$0{\cdot}74E_{dc}$	$0{\cdot}855E_{dc}$
Primary Current per Transformer Leg (Transformer Ratio 1:1)	R	$1{\cdot}57I_{dc}$	$1{\cdot}11I_{dc}$	$1{\cdot}11I_{dc}$	$0{\cdot}588I_{dc}$	$0{\cdot}816I_{dc}$	$0{\cdot}577I_{dc}$	$0{\cdot}408I_{dc}$
	L		I_{dc}	I_{dc}	$0{\cdot}471I_{dc}$	$0{\cdot}816I_{dc}$	$0{\cdot}577I_{dc}$	$0{\cdot}408I_{dc}$
Primary Volt-Amp VA_p	R	$3{\cdot}48E_{dc}.I_{dc}$	$1{\cdot}23E_{dc}.I_{dc}$	$1{\cdot}23E_{dc}.I_{dc}$	$1{\cdot}50E_{dc}.I_{dc}$	$1{\cdot}05E_{dc}.I_{dc}$	$1{\cdot}28E_{dc}.I_{dc}$	$1{\cdot}05E_{dc}.I_{dc}$
	L		$1{\cdot}11E_{dc}.I_{dc}$	$1{\cdot}11E_{dc}.I_{dc}$	$1{\cdot}21E_{dc}.I_{dc}$	$1{\cdot}05E_{dc}.I_{dc}$	$1{\cdot}28E_{dc}.I_{dc}$	$1{\cdot}05E_{dc}.I_{dc}$
Primary Utility Factor U_p	R	0·287	0·813	0·813	0·666	0·95	0·78	0·95
	L		0·90	0·90	0·827	0·95	0·78	0·95
Fundamental Ripple Frequency f_r		f	2f	2f	3f	6f	6f	6f
% Ripple $= \frac{\text{r.m.s. Fundamental Ripple Voltage}}{E_{dc}} \times 100$		121	47·2	47·2	17·7	4·0	4·0	4·0
Crest Working Voltage In terms of E_{dc}		$3{\cdot}14E_{dc}$	$3{\cdot}14E_{dc}$	$1{\cdot}57E_{dc}$	$2{\cdot}09E_{dc}$	$1{\cdot}05E_{dc}$	$2{\cdot}09E_{dc}$	$2{\cdot}42E_{dc}$
In terms of $E_{T(rms)}$		$1{\cdot}41E_{T(rms)}$	$2{\cdot}82E_{T(rms)}$	$1{\cdot}41E_{T(rms)}$	$2{\cdot}45E_{T(rms)}$	$2{\cdot}45E_{T(rms)}$	$2{\cdot}83E_{T(rms)}$	$2{\cdot}83E_{T(rms)}$

R = Resistive Load L = Inductive Load f = Supply Frequency c/s.

In the calculation of the above circuit performances, the rectifier forward voltage drop and the transformer impedance have been ignored. The primary volt-amp rating of the transformer does not take primary magnetising current into account.