A	**SCHEDULE OPERATION, TESTING AND MAINTENANCE FOR SUB-STATION BUILDINGS**					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng.**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
A	**TO CONDUCT:-**					
1.0	Compound maintenance inclusive of area one meter all round from drain, drain cleaning and surrounding area of sub station.		**X**	**X**		
2.0	Lubricate door hinges & padlocks.		**X**	**X**		
3.0	Cleaning and vacuumed the floor, wall, vermin mesh & rectify light fitting defect and replace if necessary.		**X**	**X**		
4.0	Clean cable trench and cable if necessery		**X**	**X**		
5.0	First aid poster, drawings, substation tool inspected and reported.		**X**	**X**		
6.0	All external surface of switchboard, SSB, panels,battery chanrger,aircond panel, fire alarm panel etc (including HV/LV panel 33kV and 11kV.)		**X**	**X**		
7.0	Earth loop impedance measured(not more than 3 0hm).			**X**		
8.0	Sub-station earthing resistance system inspected and rectified.		**X**	**X**		
9.0	Earthing strip and lighting protection system inspected and rectified.		**X**	**X**		
10.0	Check and report building condition Pest Control(inclusive of white ants, rat, etc).		**X**	**X**		
11.0	Check Paint & Structure of Substation.		**X**	**X**		
12.0	Check Lighting, Exhaust Fan, Switch Socket Outlet, Distribution Board, Emergency Light & Wiring Condition.		**X**	**X**		
13.0	Up date Schematic Drawing.	**X**	**X**	**X**		
14.0	Check Sign Boards "DANGER", "NO ENTRY", First Aid Chart and Substation Labeling.	**X**	**X**			
15.0	To scan all HT & LT equipments in Substations such as transformers, switchgears, HT & LV panels etc using Infrared Thermography Camera and endorsed by Service Engineer before submit the report to S.O. This service shall be conducted before and after preventive maintenance.			**X**		

B	SCHEDULE OPERATION, TESTING AND MAINTENANCE FOR 12/15MVA POWER TRANSFORMER (PPU)					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng. Monthly (1M)**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
1.0	General cleaning within compound area. External surface of transformer to be cleaned and to touch up with paint if necessary, oil leakage to be arrested, if necessary.		**X**	**X**		
2.0	To check and record:-					
	2.1 **Transformer temperature** inclusive oil and winding temperature indicator.	**X**	**X**	**X**		
	2.2 **Oil level** to be checked and record oil level gauge. Also check the soiled window glass of the oil level gauge.	**X**	**X**	**X**		
	2.3 **Oil leakage**. Check the oil leakage from the connected positions such as those of valves, meters especially in gasket parts and welded parts.	**X**	**X**	**X**		
	2.4 **Dehydrating breather.** Pay attention to the discoloration of absorbent. Watch the level of the sealingoil. Replace when discoloration.	**X**	**X**	**X**		
	2.5 **Pressure relief device**. Check for marks blowout and oil leaks.	**X**	**X**	**X**		
	2.6 **Radiator.** Check the oil leakage and the abnormal rotating sound.	**X**	**X**	**X**		
	2.7 **On Load Tap Changer(OLTC):-**			**X**		
	i). Check the tap position.	**X**	**X**	**X**		
	ii). Record the tap changing operation.	**X**	**X**	**X**		
	iii). Check the oil level which indicater withn lowest and highest mark.	**X**	**X**	**X**		
	iv). Check the dehydrating breather for discoloration of the abstrorbent and proper level of the sealing oil.	**X**	**X**	**X**		
	v). Give attention to the tap changing sounds and check the abnormal sound.	**X**	**X**	**X**		
	vi). Checks the oil leakage.	**X**	**X**	**X**		

C	SCHEDULE OPERATION, TESTING AND MAINTENANCE FOR 12/15MVA POWER TRANSFORMER					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng.**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
3.0	To perform inspection prior to shutdown as follows:-					
	3.1 **Insulation Oil** sample test as follows(TCA) for Tank & Conservator:-			**X**		
	i) Dielectric BV(more than 30kV).					
	ii) Acid Number(value less than 0.3mgKOH/g).					
	iii) Moisture(ppm).					
	3.2 **To carry out electrical test as follow:-**			**X**		
	i) Insulation Resistance Test With 5kV.					
	ii) Winding DC Resistance Test.					
	iii) Ratio Test.					
	iv) Tan. Delta Test.					
	v) Vector Group Test.					
	vi) Polarization Index Test.					
	3.3 **On Load Tap Changer**. To check as follows:-		**X**			
	i) Operating sound. To ensure no abnormal sound.					
	ii) Operating of limit switch.Shall stop at extreme upper & lower position.					
	iii) Indicating devices. Shall operate and indicate correctly.					
	3.4 **Bushing**:-			**X**		
	i) Measurement of insulation resistance and measure only the bushing when occasion comes.					
	ii) Inspection for local heating.					
	iii) Check the pollution of porcelain.					
	iv) Check the damage of porcelain.					
	v) Inspect the oil leakage.					
	3.5 **Pressure Relief Device.**			**X**		
	i) Check the oil leakage.					
	ii) Clean inside terminal box(pull box) and retighten the loosened screws of terminals.					
	iii) Check the operation of alarm contact.					

D	SCHEDULE OPERATION, TESTING AND MAINTENANCE FOR 12/15MVA POWER TRANSFORMER					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng.**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
	TO CONDUCT:-					
	3.6 **Indicators:-**			**X**		
	i) Clean the inside of terminal box and retighten the loosened screws of terminal.					
	ii) Check the mal-indication.					
	iii) Check the operation of alarm contact.					
	3.7 **Protective relays:-**					
	i) Clean the inside of terminal box and retighten the loosened screws of terminals.		**X**	**X**		
	ii) Check the operation of alarm contact.			**X**		
	3.8 **Protection and Control Circuits:-**			**X**		
	i) Test of alarm signal circuit for relays such as Buchholz relay, pressure relief device, temperature, indicator, oil level, cooling fan etc.					
	ii) Measurement of insulation resistance of wiring which should be 1MW and above by 500V or 1000V megger.					
	iii) Visual inspection of wiring, check the looseness of screws of terminal blocks, discoloration and wear.	**X**	**X**	**X**		
	3.9 **Visual inspection of the externals.**	**X**	**X**	**X**		
	i) Inspect the oil leakage from transformer body and accessories. ii) Inspect the surface for condition of no rusting. iii) Inspect the main circuit, grounding circuit, auxiliary circuit, foundition bolts and others such as looseness of connection.					
4.0	**Remote Tap Changer Cubicle(RTCC):-**			**X**		
	4.1 To Carry out general cleaning internal and external of RTCC panels. 4.2 To calibrate the Automatic Voltage Regulator(AVR).					
5.0	All records and/or test results shall be submitted to P. P UiTM	**X**	**X**	**X**		
6.0	To record tap motion and tap setting position is good condution.	**X**				

E	SCHEDULE OPERATION, TESTING AND MAINTENANCE FOR "OIL TYPE" OF DISTRIBUTION TRANSFORMER					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng.**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
1.0	General cleaning - Room, surounding area and external transformer surface to be cleaned and to touch up with paint if necessary.		**X**	**X**		
2.0	Check the winding temperature and instrumentation circuits.	**X**	**X**	**X**		
3.0	Check all connection for correct degree of tightness.			**X**		
4.0	**To carry out tests as follow:-** i) Insulation oil sample test(Dielectric Strength Test):(2.5mm/ >30kV or 4mm>60kV) ii) Insulation test for cables and transformer. iii) Winding Resistance Test. iv) Ratio Test. v) Polarization Index Test. vi) Tan Delta Test. vii) Vector Group Test.			**X**		
5.0	All records and/or test results shall be submitted to P. P UiTM	**X**	**X**	**X**		

F	SCHEDULE OPERATION, TESTING AND MAINTENANCE FOR " DRY TYPE" OF DISTRIBUTION TRANSFORMER					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng.**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
1.0	General cleaning - Room,surounding area and external surface to be cleaned and to if necessary.		**X**	**X**		
2.0	Check the winding temperature and instrumentation circuits.	**X**	**X**	**X**		
3.0	Check the cooling fan operation	**X**	**X**	**X**		
4.0	Ensure that the ventilation in transformer room is good.	**X**	**X**	**X**		
5.0	Visual inspection for coils, wiring and monitoring equipment for any suspected damage.			**X**		
6.0	Check all connection for correct degree of tightness.			**X**		
7.0	Clean and remove dust/contamnation from transformer.			**X**		
8.0	Check and rectified for any abnormally high temperature/noise level and rectify.	**X**		**X**		
9.0	**To carry out electrical test as follow:-** i) Insulation oil sample test(Dielectric Strength Test). ii) Insulation test for cables and transformer. iii) Winding Resistance Test. iv) Ratio Test. v) Tan Delta Test. vi) Vector Group Test.			**X**		
10.0	All records and/or test results shall be submitted to P. P UiTM	**X**	**X**	**X**		

G	SCHEDULE OPERATION, SERVICING AND MAINTENANCE FOR 33KV GIS BREAKER					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng.**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
	MAINTENANCE FOR 33KV GIS BREAKER					
1.0	To conduct general cleaning within compound area. To rub, wipe and/or vacuuming panels.		**X**	**X**		
2.0	**To conduct visual check/inspection on:-**	**X**	**X**	**X**		
	2.1 Appearance(rust, dew, paint).					
	2.2 Gas pressure.					
	2.3 Open-Close indicator.					
	2.4 Abnormal noise and smell.					
	2.5 Loose bolts and nuts.					
	2.6 Deformation, damage, wear.					
3.0	To check and inspect the SF6 leak gauge. The gas shall remain at 1.35kg/m2, refill if necessary.	**X**	**X**	**X**		
4	Operational/ Funtional test with all auxiliary component			**X**		
	4.1 Circuit breaker timing test of closing and opening operation			**X**		
	4.2 Circuit breaker with Busbar contact resistance			**X**		
	4.3 SF6 Quality Measurement by measuring the moisture content SF6 Purity and SO2			**X**		
	4.4 Insulation resistance test of Busbar with 5kV DC			**X**		

H	SCHEDULE OPERATION, TESTING SERVICING & MAINTENANCE FOR 11KV SWITCHGEAR(VCB)					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng.**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
1.0	General cleaning within compound area. To rub, wipe, brush and /or vacuuming at the internal and external of Switchgear. Use lint-free clean cloth to clean the switchgear.		**X**	**X**		
2.0	To check and conform the switchgear are free from discoloration, oxidization and deformation.			**X**		
3.0	To check and conform heaters, indicating lamps, auxiliary switches, relays etc are well functioned. Replace if necessary.	**X**	**X**	**X**		
4.0	To check CT's and VT's for physical appearance and that all realted connections are tight. The insulation material should be cleaned and closely examined any signs of damage such as cracks, tracking marks or peeling.	**X**	**X**	**X**		
5.0	To service/overhaul VCB, shutter, busbar, earthing and cable compartments etc.			**X**		
6.0	**To carry out testing by using 5kV tester(Megaohm) as follows:-** i) IR test on Busbar. ii) IR test on Feeder and Transformer cables.			**X**		
7.0	**To carry out testing on VCB as follows:-** i) IR test for both VCB open and close position in Gegaohm. ii) VCB contact resistance test in mikroohm. iii) Test on Vacuum check - 22kV for 30sec. iv) Timing test for both opening and closing time of circuit breaker in msec.			**X**		
8.0	All records and/or test results shall be submitted to P. P UiTM	**X**	**X**	**X**		

I	SCHEDULE OPERATION, TESTING SERVICING & MAINTENANCE FOR 33kV & 11kV CONTROL RELAY PANEL					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng.**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
1.0	General cleaning inside the room. To rub, wipe and vacuuming external, on top the and internal of the panels		**X**	**X**		
2.0	To check status on alarm annuciators, switches, heaters, ammeter and voltmeter etc.	**X**	**X**	**X**		
3.0	To carry out relay calibration at each panels.			**X**		
4.0	To conduct current and voltage transducer test.			**X**		
5.0	To conduct trip test.			**X**		
6.0	To conduct circuit breaker operations.			**X**		
7.0	Carry out functional test and check tripping indication alarm operations.			**X**		

J	SCHEDULE OPERATION, SERVICING & MAINTENANCE FOR 11kV NEUTRAL EARTH RESISTOR(NER)					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng.**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
1.0	General cleaning within compound area.		**X**	**X**		
2.0	**To carry out as following test:-** 2.1 Resistance test. 2.2 Insulation test. 2.3 Earthing test.			**X**		
3.0	All records and/or test results shall be submitted to P. P UiTM		**X**	**X**		
5.0	To conduct trip test.			**X**		
6.0	To conduct circuit breaker operations.			**X**		
7.0	Carry out functional test and check tripping indication alarm operations.			**X**		
8	Visual inspection of the externels	**X**				

K	SCHEDULE OPERATION, TESTING SERVICING & MAINTENANCE FOR LOW VOLTAGE MAIN SWITCHBOARD(MSB)					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng.**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
1.0	Test insulation at 500V and record in Megaohm.			X		
2.0	Check all connections, conductors, busbars, switch contacts, fuse contacts, etc. voltmeter etc.		X	X		
3.0	Check all cable boxes and report.	X	X	X		
4.0	General cleaning room and vacuuming of Mains Switchboard internal and external		X	X		
5.0	Test and measure earth loop impedance in ohms at each board.		X	X		
6.0	Grease all the moving parts or gears in ACB/changeover Contactor/ Switch Fuses.			X		
7.0	Services and maintain A.C.B switching mechanism to ensure operation is in order.			X		
8.0	All records and/or test results shall be submitted to P. P UiTM	X	X	X		
9.0	To record electricity meter reading for every month and submit a report for every kWh meter and DPM at all MSB and air condition SSB panel at every building and Bangunan Akademik PERDA .	X				
1.0	Insulation test for every cables from MSB to SSB			X		

L	SCHEDULE OPERATION, TESTING SERVICING & MAINTENANCE FOR PROTECTION RELAYS					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng.**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
1.0	General cleaning and wipe of any dust on the protection relay covers DPM, KWH meter and meter board.		**X**	**X**		
2.0	To carry out recalibration on all HV & LV protection relays such as Diff. Relay, REF, SBEF, OC/EF, ELR etc. as required by Energy Commission respectively. If necessary, setting within limits as specified by B.S.S.Upon calibration, the sticker shall be pasted on the relays itself for reference.	**X (visual check & inspection relays.)**	**X (visual check & inspection relays.)**	**X**		
3.0	Service H.V & L.V relays. Test and record relay operation, characteristics in formats to be submitted for approval prior to tests.			**X**		
4.0	Test integrity of all HV & LV protection secondary circuits, measure relay currents at normal primary load currents. Record result.			**X**		
5.0	Test stability of earth fault protection and any other current balanced protection scheme and record results and action taken.			**X**		
6.0	To carry out as following test for CT:-					
	6.1 Primary Injection			**X**		
	6.2 Secondary Injection			**X**		
	6.3 IR Test			**X**		
	6.4 Magnetiszation Curve test			**X**		
7.0	Carry out funtional test af all HV & LV and record all corresponding result.			**X**		
8	Record result and submit report to P.P. Inform P.PO if found any fault for further action.	**X**	**X**	**X**		

M	SCHEDULE OPERATION, TESTING SERVICING & MAINTENANCE FOR BATTERY CHARGER AND BATTERY BANK					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng.**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
1.0	Mechanical check on battery cabinet/stand.	X	X	X		
2.0	Mechanical check on battery cables.	X	X	X		
3.0	Mechanical tightening check on connectors.	X	X	X		
4.0	Cleaning of battery cells with soft brush or damp cloth.		X	X		
5.0	Anticorrosion treatment of connectors and pole screws.		X	X		
6.0	Check connector covers.	X	X	X		
7.0	Electrolyte level checking and topping up with deionised or distilled water.		X	X		
8.0	Check the ambient temperature.	X	X	X		
9.0	Check the float charge current/voltage.	X	X	X		
10.0	Check on boost charge current/voltage.	X	X	X		
11.0	Voltage check on each cell.	X	X	X		
12.0	Check on electrolyte specific gravity.		X	X		
13.0	110VDC/ 30VDC, battery performance test.		X	X		
14.0	Cell capacity/ discharge test		X	X		
15.0	Electrolyte carbonate test.		X	X		

N	SCHEDULE OPERATION, TESTING SERVICING & MAINTENANCE FOR FIRE FIGHTING SYSTEM.					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng.**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
	VISUAL CHECK & INSPECTION **FIRE FIGHTING SYSTEM INDOOR & OUTDOOR**					
1.0	Portable Fire Extinguishers/CO2 - Check for all fire extinguishers expiry date for Bomba Inspection.	**X**				
2.0	Installation Condition.	**X**				
3.0	All records and reports shall be submitted to P. P UiTM	**X**				

O	**SCHEDULE OPERATION, TESTING SERVICING & MAINTENANCE FOR CAPASITOR BANK**					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng.**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
	VISUAL CHECK & INSPECTION					
1.0	Capacitor Details:-Visual check, inspection and measured values :-	**X**	**X**	**X**		
	1.1 Capasitor Rating(kVAR)					
	1.2 Magnetic Contactor Rating(Amp)					
	1.3 Circuit Breaker Rating(Amp)					
	1.4 Capacitor load (A) - R.Y.B					
2.0	General cleaning and cleaning of capacitor bank panel inspect for any sign of over heating / flash over. Test capacitor and functional test ON Power Factor Regulator replace, if necessary.		**X**	**X**		
3.0	All records and/or test results shall be submitted to P. P UiTM	**X**	**X**	**X**		

P	SCHEDULE OPERATION, TESTING SERVICING & MAINTENANCE FOR SUB-STATION BUILDINGS					
Item	**Description Of Operation, Servicing and Maintenance**	**(i) Visiting Eng.**	**(ii) Routine**	**(ii) Preventive**	**Satisfactory/Not satisfactory**	**Remark**
	TO CONDUCT:-					
1.0	Compound maintenance inclusive of area one meter all round from drain & drain cleaning.		**X**	**X**		
2.0	Lubricate door hinges & padlock		**X**	**X**		
3.0	Cleaning and vacuumed the floor ,wall, vermin mesh & rectify defect and replace if necessary		**X**	**X**		
4.0	Clean cable trench		**X**	**X**		
5.0	First aid poster, drawing, substation tool inspected and reported		**X**	**X**		
6.0	All external surface of switchboard, panels etc to be vaccuumed		**X**	**X**		
7.0	Earth loop imoedence measured (not more than 3 ohm)			**X**		
8.0	Sub-station earthing resistence system inspected and rectified		**X**	**X**		
9.0	Earthhing strip and lighting protection system inspected and rectified.		**X**	**X**		
10.0	Check and report building condition Pest Control (inclusive of white ants, rat, etc)		**X**	**X**		
11.0	Check Paint & Structure of Substation		**X**	**X**		
12.0	Check lighting, Exhaust Fan, Switch Socket Outlet, Distribution Board, Emergency Light & Wiring Condition		**X**	**X**		
13.0	Check and Up date Schematic Drawing (if required)	**X**	**X**	**X**		
14.0	Check Sign Boards "Danger", "No Entry", First Aid Chat and Substation Labeling	**X**	**X**			