## SYLLABUS FOR COMPUTER BASED TEST (CBT) FOR RECRUITMENT OF JUNIOR MAINTENANCE & OPERATOR TRAINEE (JMOT)

A. SUBJECT KNOWLEDGE (80%): 160 NOS. OF MULTIPLE CHOICE QUESTIONS (MCQS)		
SL. NO.	SUB TOPIC	DETAIL DESCRIPTION
1	OCCUPATIONAL SAFETY & HEALTH	BASIC SAFETY INTRODUCTION, PERSONAL PROTECTION: - BASIC INJURY PREVENTION, BASIC FIRST AID, HAZARD IDENTIFICATION AND AVOIDANCE, SAFETY SIGNS FOR DANGER, WARNING, CAUTION & PERSONAL SAFETY MESSAGE. USE OF FIRE EXTINGUISHERS. VISIT & OBSERVATION OF SECTIONS. VARIOUS SAFETY MEASURES INVOLVED IN THE INDUSTRY. ELEMENTARY FIRST AID. CONCEPT OF STANDARD
2	OCCUPATIONAL SAFETY & HEALTH IMPORTANCE OF HOUSEKEEPING & GOOD SHOP FLOOR PRACTICES.	HEALTH, SAFETY AND ENVIRONMENT GUIDELINES, LEGISLATIONS & REGULATIONS AS APPLICABLE. DISPOSAL PROCEDURE OF WASTE MATERIALS LIKE COTTON WASTE, METAL CHIPS/BURRS ETC. BASIC SAFETY INTRODUCTION, PERSONAL PROTECTIVE EQUIPMENT (PPE):- BASIC INJURY PREVENTION, BASIC FIRST AID, HAZARD IDENTIFICATION AND AVOIDANCE, SAFETY SIGNS FOR DANGER, WARNING, CAUTION & PERSONAL SAFETY MESSAGE. PREVENTIVE MEASURES FOR ELECTRICAL ACCIDENTS & STEPS TO BE TAKEN IN SUCH ACCIDENTS. USE OF FIRE EXTINGUISHERS.
3	INTRODUCTION OF NATIONAL ELECTRICAL CODE 2011	EXPLANATION, DEFINITION AND PROPERTIES OF CONDUCTORS, INSULATORS AND SEMI-CONDUCTORS. VOLTAGE GRADING OF DIFFERENT TYPES OF INSULATORS, TEMP. RISE PERMISSIBLE TYPES OF WIRES & CABLES STANDARD WIRE GAUGE SPECIFICATION OF WIRES & CABLES-INSULATION & VOLTAGE GRADES - LOW, MEDIUM & HIGH VOLTAGE PRECAUTIONS IN USING VARIOUS TYPES OF CABLES / FERRULES
4	OHM'S LAW, RESISTORS KIRCHHOFF'S LAWS AND APPLICATIONS.	OHM'S LAW - SIMPLE ELECTRICAL CIRCUITS AND PROBLEMS. READING OF SIMPLE ELECTRICAL LAYOUT. RESISTORS -LAW OF RESISTANCE. SERIES AND PARALLEL CIRCUITS. KIRCHHOFF'S - LAWS AND APPLICATIONS. WHEATSTONE BRIDGE PRINCIPLE AND ITS APPLICATIONS. EFFECT OF VARIATION OF TEMPERATURE ON RESISTANCE. DIFFERENT METHODS OF MEASURING THE VALUES OF RESISTANCE
5	COMMON ELECTRICAL ACCESSORIES	COMMON ELECTRICAL ACCESSORIES, THEIR SPECIFICATIONS IN LINE WITH NEC 2011- EXPLANATION OF SWITCHES LAMP HOLDERS, PLUGS AND SOCKETS. DEVELOPMENTS OF DOMESTIC CIRCUITS, ALARM & SWITCHES, WITH INDIVIDUAL SWITCHES, TWO WAY SWITCH. SECURITY SURVEILLANCE, FIRE ALARM, MCB, ELCB, MCCB.
6	CHEMICAL EFFECT OF ELECTRIC CURRENT	CHEMICAL EFFECT OF ELECTRIC CURRENT- PRINCIPLE OF ELECTROLYSIS. FARADAY'S LAW OF ELECTROLYSIS. BASIC PRINCIPLES OF ELECTRO - PLATING AND ELECTRO CHEMICAL EQUIVALENTS. EXPLANATION OF ANODES AND CATHODES. LEAD ACID CELL - DESCRIPTION, METHODS OF CHARGING-PRECAUTIONS TO BE TAKEN & TESTING EQUIPMENT, NI-CADMIUM & LITHIUM CELL, CATHODIC PROTECTION. ELECTROPLATING, ANODISING. DIFFERENT TYPES OF LEAD ACID CELLS.
7	RECHARGEABLE DRY CELL, DESCRIPTION ADVANTAGES AND DISADVANTAGES.	RECHARGEABLE DRY CELL, DESCRIPTION ADVANTAGES AND DISADVANTAGES. CARE AND MAINTENANCE OF CELLS GROUPING OF CELLS OF SPECIFIED VOLTAGE & CURRENT, SEALED MAINTENANCE FREE BATTERIES, SOLAR BATTERY.

SL.	SUB TOPIC	DETAIL DESCRIPTION
NO.		
8	INVERTER, BATTERY	INVERTER, BATTERY CHARGER, UPS-PRINCIPLE OF WORKING.
	CHARGER, UPS-PRINCIPLE OF WORKING	LEAD ACID CELL, GENERAL DEFECTS & REIVIEDIES.
		NICKEL ALKALI CELL-DESCRIPTION CHARGING. POWER & CAPACITY OF CELLS.
		COMPARISON AND ADVANTACES D.C. AND A.C. DELATED TERMS
	ALTERNATING CURRENT	CUMPARISON AND ADVANTAGES D.C AND A.C. RELATED TERMS
		FREQUENCE, INSTANTANEOUS VALUE, R.W.S. VALUE, AVERAGE VALUE, PEAK
		CENEDATION OF SINE WAVE, DHASE AND DHASE DIFFEDENCE
		GENERATION OF SINE WAVE, PHASE AND PHASE DIFFERENCE.
		INDUCTIVE AND CAPACITIVE REACTAINCE IMPEDAINCE (2), POWER FACTOR (P.F).
9		CIRCUITS SINGLE PHASE AND THREE-PHASE SYSTEM FTC
		PROBLEMS ON A C CIRCUITS
		POWER CONSTINUED IN SERIES AND PARALLEL D.E. ETC
		CONCEPT THREE_PHASE STAR AND DELTA CONNECTION
		LINE AND PHASE VOLTAGE CURRENT AND POWER IN A 3 PHASE CIRCUITS WITH
		BALANCED AND LINBALANCED LOAD
		PRINCIPLE OF DIFFERENT METHODS OF FARTHING LE PIPE PLATE ETC
		IMPORTANCE OF FARTHING
		IMPROVING OF FARTH RESISTANCE
10	EARTHING	FARTH LEAKAGE CIRCUIT BREAKER (FLCB)
		IN ABSENCE OF LATEST REVISION IN RESPECTIVE BIS PROVISION FOR FARTHING IT
		IS RECOMMENDED TO FOLLOW IEC GUIDELINES
		SEMICONDUCTOR ENERGY I EVEL ATOMIC STRUCTURE 'P' TYPE AND 'N' TYPE
		TYPE OF MATERIALS - P-N-JUNCTION. CLASSIFICATION OF DIODES – REVERSE AND
11	BASIC ELECTRONICS	FORWARD BIAS. HEAT SINK. SPECIFICATION OF DIODE PIV RATING.
		EXPLANATION AND IMPORTANCE OF D.C. RECTIFIER CIRCUIT. HALF WAVE. FULL
		WAVE AND BRIDGE CIRCUIT. FILTER CIRCUITS-PASSIVE FILTER.
		I.E. RULES.
		TYPES OF WIRINGS BOTH DOMESTIC AND INDUSTRIAL.
		SPECIFICATIONS FOR WIRING.
		GRADING OF CABLES AND CURRENT RATINGS. PRINCIPLE OF LAYING OUT IN
	ELECTRIC WIRINGS	DOMESTIC WIRING.
		VOLTAGE DROP CONCEPT.
12		WIRING SYSTEM - P.V.C., CONCEALED SYSTEM.
12		MAINTENANCE AND REPAIRING DATA SHEET PREPARATION. SPECIFICATIONS,
		STANDARDS FOR CONDUITS AND ACCESSORIES
		- POWER WIRING
		- CONTROL WIRING
		- INFORMATION COMMUNICATION
		- ENTERTAINMENT WIRING.
		TESTING OF WIRING INSTALLATION BY MEGGAR.
13	D.C. MACHINES	GENERAL CONCEPT OF ELECTRICAL MACHINES.
		<b>PRINCIPLE OF D.C. GENERATOR.</b> USE OF ARMATURE, FIELD COIL, POLARITY, YOKE,
		COOLING FAN, COMMUTATOR, SLIP RING BRUSHES, LAMINATED CORE.
		EXPLANATION OF D.C. GENERATORS-TYPES, PARTS. E.M.F. EQUATION-SELF
		EXCITATION AND SEPARATELY EXCITED GENERATORS-PRACTICAL USES. BRIEF
		DESCRIPTION OF SERIES, SHUNT AND COMPOUND GENERATORS.
14	D.C. MOTORS	TERMS USED IN D.C. MOTOR-TORQUE, BRAKE TORQUE, SPEED, BACK-E.M.F. ETC.
		AND THEIR RELATIONS, TYPES OF D.C. MOTOR. STARTERS USED IN D.C. MOTORS.
		RELATED PROBLEMS. CHARACTERISTICS OF D.C. MOTOR, LOSSES & EFFICIENCY,
		APPLICATION OF D.C. MOTORS. CARE, ROUTINE & PREVENTIVE MAINTENANCE.

SL. NO.	SUB TOPIC	DETAIL DESCRIPTION
15	TRANSFORMER	WORKING PRINCIPLE OF TRANSFORMER. CLASSIFICATION C.T., P.T. INSTRUMENT AND AUTO TRANSFORMER (VARIAC), CONSTRUCTION, SINGLE PHASE AND POLY PHASE. E.M.F. EQUATION, PARALLEL OPERATION OF TRANSFORMER, THEIR CONNECTIONS. REGULATION AND EFFICIENCY. TYPE OF COOLING FOR TRANSFORMER. PROTECTIVE DEVICES. SPECIFICATIONS, SIMPLE PROBLEMS ON E.M.F. EQUATION, TURN RATIO, REGULATIONS AND EFFICIENCY. SPECIAL TRANSFORMERS. TRANSFORMER – CLASSIFICATION OF TRANSFORMER. COMPONENTS, AUXILIARY PARTS I.E. BREATHER, CONSERVATOR, BUCHHOLZE RELAY, OTHER PROTECTIVE DEVICES. TRANSFORMER OIL TESTING AND TAP CHANGER (OFF LOAD AND ON LOAD). DRY TYPE TRANSFORMER. BUSHINGS AND TERMINATION.
16	ELECTRICAL MEASURING INSTRUMENTS	ELECTRICAL MEASURING INSTRUMENTS - TYPES, INDICATING TYPES. DEFLECTING TORQUE, CONTROLLING TORQUE AND DAMPING TORQUE , PMMC & MI METER (AMMETER, VOLTMETER) -RANGE EXTENSION -MULTIMETER (DIGITAL/ANALOG) -WATTMETER - P.F. METER - P.F. METER - ENERGY METER (DIGITAL/ANALOG) -INSULATION TESTER (MEGGER), EARTH TESTER. -FREQUENCY METER -PHASE SEQUENCE METER -MULTIMETER –ANALOG AND DIGITAL -TONG TESTER -TECHOMETER.
17	THREE PHASE INDUCTION MOTOR	WORKING PRINCIPLE - PRODUCTION OF ROTATING MAGNETIC FIELD, SQUIRREL CAGE INDUCTION MOTOR, SLIP - RING INDUCTION MOTOR. CONSTRUCTION, CHARACTERISTICS AND SPEED CONTROL, SLIP & TORQUE. CONTROL & POWER CIRCUIT OF STARTERS D.O.L STARTER, STAR / DELTA STARTER, AUTOTRANSFORMER STARTER, ROTOR RESISTANCE STARTER, ETC. SINGLE PHASING PREVENTER. LOSSES & EFFICIENCY. APPLICATION OF INDUCTION MOTOR CARE, ROUTINE & PREVENTIVE MAINTENANCE.
18	SINGLE PHASE INDUCTION MOTOR	WORKING PRINCIPLE, DIFFERENT METHOD OF STARTING AND RUNNING (CAPACITOR START, PERMANENT CAPACITOR, CAPACITOR START & RUN, SHADED POLE TECHNIQUE). FHP MOTORS, REPULSION MOTOR, STEPPER MOTOR, HYSTERESIS MOTOR, RELUCTANCE MOTOR. APPLICATION OF SINGLE PHASE INDUCTION MOTOR <b>UNIVERSAL MOTOR</b> - ADVANTAGES, PRINCIPLE, CHARACTERISTICS, APPLICATIONS IN DOMESTIC AND INDUSTRIAL APPLIANCES, FAULT LOCATION AND RECTIFICATION. BRAKING SYSTEM OF MOTOR.
19	ALTERNATOR	EXPLANATION OF ALTERNATOR, TYPES OF PRIME MOVER, EFFICIENCY, REGULATIONS, PHASE SEQUENCE, PARALLEL OPERATION. SPECIFICATION OF ALTERNATORS AND BRUSHLESS ALTERNATOR. VERIFY THE EFFECT OF CHANGING THE FIELD EXCITATION AND POWER FACTOR CORRECTION OF INDUSTRIAL LOAD. TRACING OF PANEL WIRING DIAGRAM OF AN ALTERNATOR. DRAWING THE SCHEMATIC DIAGRAM OF AUTOMATIC VOLTAGE REGULATORS OF A.C. GENERATORS.

SL. NO.	SUB TOPIC	DETAIL DESCRIPTION
		WORKING PRINCIPLE, EFFECT OF CHANGE OF EXCITATION AND LOAD.
20	SYNCHRONOUS MOTOR	V AND ANTI V CURVE. CAUSE OF LOW POWER FACTOR.
		METHOD OF POWER FACTOR IMPROVEMENT.
21	TRANSFORMER WINDING	SMALL TRANSFORMER WINDING TECHNIQUES
		MOTOR WINDING TERMINOLOGY - CLASSIFICATION OF CONDUCTING AND
22	AC MACHINE WINDING	INSULATING MATERIALS USED IN WINDING - TYPES AND METHODS OF WINDING IN
		SINGLE AND THREE PHASE MOTORS.
		LAWS OF ILLUMINATIONS, TERMINOLOGY USED, ILLUMINATION FACTORS,
		INTENSITY OF LIGHT - IMPORTANCE OF LIGHT, HUMAN EYE FACTOR, UNITS.
		-NEON SIGN HALOGEN, MERCURY VAPOUR, SODUUM VAPOUR, ELLIORESCENT TUBE
23	III UMINATION	CEL LED SOLAR LAMP & PHOTO CELL APPLICATIONS
23		DECORATION LIGHTING, DRUM SWITCHES, EFFICIENCY IN LUMENS PER WATT.
		CALCULATIONS OF LUMENS.
		ESTIMATING PLACEMENT OF LIGHTS, FANS AND RATINGS.
		FREE HAND SKETCHING OF MERCURY VAPOUR LAMP, SODIUM VAPOUR LAMP,
		FLUORESCENT TUBE (SINGLE & TWINE), MHL LAMP AND THEIR CONNECTION.
		CODE OF PRACTICE AND RELEVANT SPAN. WIRING OF ELECTRIC MOTORS, CONTROL
		PANEL, ETC.
24	INDUSTRIAL WIRING	TYPES, SPECIFICATIONS, ADVANTAGES OF DIFFERENT TYPES OF CIRCUIT BRACKETS
		CONSTRUCTION AND MAINTENANCE.
		WORKING PRINCIPLE AND CONSTRUCTION OF DOMESTIC AND AGRICULTURAL
		APPLIANCES - THEIR MAINTENANCE.
		ISOLATOR, PUSHBUTTON SWITCHES, INDICATING LAWIPS, MICB, FUSE, CONTACTOR,
25	CONTROL ELEMENTS	TRANSFORMERS WIRING ACCESSORIES: RACE WAYS / CABLE CHANNEL DIN RAII
25		TERMINAL CONNECTORS THIMBLES LUGS FERRULES CABLE BINDING STRAP &
		BUTTONS, NYLON CABLE TIES, SLEEVES, GROMATS & CLIPS
		WORKING PRINCIPLES AND CIRCUITS OF COMMON DOMESTIC EQUIPMENT AND
		APPLIANCES. – CALLING BELL, BUZZER, ALARMS, ELECTRIC IRON, HEATER, LIGHT.
26	DOMESTIC APPLIANCES	ELECTRIC KETTLE, HEATER / IMMERSION HEATER, HOT PLATE, OVEN, GEYSER,
		COOKING RANGE, MIXER, WASHING MACHINE, MOTOR PUMP SET, ETC.
		CONCEPT OF NEUTRAL AND EARTH.
		GENERATION SOURCES OF ENERGY, COMPARISON OF ENERGY RESOURCES. TYPES
27		OF FUELS. ADVANTAGES OF LIQUID FUEL & SOLID FUEL.
27	POWER GENERATION	VARIOUS WAYS OF ELECTRICAL POWER GENERATION. • THERMAL •
		DIESEL BASED & GAS BASED TUBBINE CONSTITUENTS IN STEAM DOWED STATION
		SCHEMATIC ARRANGEMENT OF HYDRO-FI FCTRIC POWER STATION.
28	HYDRO FLECTRIC	OF HYDRO ELECTRIC PLANT. TYPES OF HYDRO ELECTRIC POWER STATION
		ADVANTAGES & DISADVANTAGES.
29		AN INTRODUCTION TO POWER GENERATION THROUGH NON-CONVENTIONAL
	NON-CONVENTIONAL	POWER GENERATION SUCH AS SOLAR, BIO - GAS, WIND ENERGY AND MICRO -
		HYDEL, TIDAL WAVES, ETC. BASIC PRINCIPAL, ADVANTAGES & DISADVANTAGES OF
		EACH.

SL.	SUB TOPIC	DETAIL DESCRIPTION
NO.		
		COMPARISON OF AC AND DC TRANSMISSION ADVANTAGES OF HIGH
		TRANSMISSION VOLTAGE
	TRANSMISSION OF	INTRODUCTION TO SINGLE PHASE . THREE PHASE-3 WIRE SYSTEM IN TRANSMISSION
30	ELECTRICAL POWER	LINES, OVERHEAD LINES
		MAIN COMPONENTS OF OVERHEAD LINES - TYPES OF POWER LINE LOW VOLTAGE
		LINE, MEDIUM VOLTAGE LINE & HIGH VOLTAGE LINE VOLTAGE STANDARD
		CONDUCTOR MATERIALS, LINE SUPPORTS, INSULATORS, TYPES OF INSULATORS.
31	UNDER GROUND CABLE	CONSTRUCTION OF CABLES. MATERIAL FOR CABLES, ITS INSULATION.
		CLASSIFICATION OF CABLES, CABLES FOR 3 - PHASE SERVICE, LAYING OF
		UNDERGROUND CABLE. TYPES OF CABLE FAULTS AND THEIR LOCATION.
		FUNCTION AND EQUIPMENT USED IN SUBSTATION.
		CLASSIFICATION OF DISTRIBUTION SYSTEM - AC DISTRIBUTION, OVERHEAD V/S
32	DISTRIBUTION OF FOWER	UNDERGROUND DISTRIBUTION SYSTEM.
		ESSENTIAL FEATURES OF SWITCHGEARS. ISOLATOR, SWITCH GEAR EQUIPMENTS,
		BUS-BAR ARRANGEMENT, SHORT CIRCUIT, FAULTS IN POWER SYSTEM.
33	CIRCUIT BREAKERS	INTRODUCTION & CLASSIFICATION OF CIRCUIT BREAKERS
		LIGHTENING ARRESTORS USED IN HT LINES.
		INTRODUCTION, USE OF ELECTRICITY, HOW ELECTRICITY IS PRODUCED, TYPES OF
34	BASIC FLECTRICITY	CURRENT - AC, DC, THEIR COMPARISON, VOLTAGE, RESISTANCE, THEIR UNITS.
54		CONDUCTOR, INSULATOR, TYPES OF CONNECTIONS - SERIES, PARALLEL, ELECTRIC
		POWER, HORSE POWER, ENERGY, UNIT OF ELECTRICAL ENERGY
		GRAPHIC SYMBOLS FOR ROTATING MACHINES.
		SKETCHING OF BRUSH AND BRUSH GEAR OF D.C. MACHINES.
		SKETCHING OF D.C. 3-POINT AND 4-POINT STARTER.
35	D.C. MACHINES	LAYOUT ARRANGEMENT OF D.C. GENERATORS & MOTORS, CONTROL PANEL.
		EXERCISES ON CONNECTION TO MOTORS THROUGH AMMETER, VOLTMETER & K.W.
		METERS OF ELECTRICAL WIRING DIAGRAM.
		DRAWING THE SCHEMATIC DIAGRAM OF D.C. MOTOR SPEED CONTROL BY
		THYRISTOR / DC DRIVE.
		GRAPHIC SYMBOLS FOR TRANSFORMERS.
36	TRANSFORMER	FREE HAND SKETCHING OF TRANSFORMER AND AUXILIARY PARTS AND SECTIONAL
		VIEWS. SKETCHING A BREATHER. DRAWING THE DIAGRAM OF TYPICAL MARKING
		PLATE OF A DISTRIBUTION TRANSFORMER.
		FREE HAND SKETCHING OF SLIP-RING AND SQUIRREL CAGE INDUCTION MOTOR.
		TYPICAL WIRING DIAGRAM FOR DRUM CONTROLLER OPERATION OF A.C. WOUND
27	THREE PHASE INDUCTION	RUTUR MUTUR.
37	MOTOR	DRAWING THE SCHEMATIC DIAGRAM OF AUTOTRANSFORMER STARTER, DOL
		STARTER AND STAR DELTA STARTER.
		DRAWING THE SCHEWATIC DIAGRAM OF A.C. MOTOR SPEED CONTROL BY SCR / AC
38		DIFFERENT TYPE OF DISTRIBUTION SYSTEMS AND METHODS OF CONNECTIONS
		LAYOUT DIAGRAM OF A SUBSTATION
		SINGLE LINE DIAGRAM OF SUBSTATION FEEDERS
		PRACTICE IN READING PANEL DIAGRAM
39		
	CONTROL PANEL	FORWARD & REVERSE OPERATION OF INDUCTION MOTOR ALITOMATIC STAR DELTA
		STARTER
		AUTOMATIC STAR DELTA STARTER WITH CHANGE OF DIRECTION OF ROTATION
		SEQUENTIAL CONTROL OF THREE MOTORS.

SL. NO.	SUB TOPIC	DETAIL DESCRIPTION
40	SIGN & SYMBOL TRADE RELATED ALTERNATING CURRENT	DRAWING OF SIMPLE ELECTRICAL CIRCUIT USING ELECTRICAL SYMBOLS. DRAWING OF SINE SQUARE & TRIANGULAR WAVES. DIAGRAM OF BATTERY CHARGING CIRCUIT. PRACTICE IN READING TYPICAL EXAMPLE OF CIRCUIT CONTAINING R, L & C. READING OF ELECTRICAL DRAWING.
41	MAGNETISM	CLASSIFICATION OF MAGNETS, METHODS OF MAGNETISING, MAGNETIC MATERIALS. PROPERTIES, CARE AND MAINTENANCE. PARA AND DIAMAGNETISM AND FERRO MAGNETIC MATERIALS. PRINCIPLE OF ELECTRO-MAGNETISM, MAXWELL'S CORKSCREW RULE, FLEMING'S LEFT AND RIGHT HAND RULES, MAGNETIC FIELD OF CURRENT CARRYING CONDUCTORS, LOOP AND SOLENOID. MMF, FLUX DENSITY, RELUCTANCE. B.H. CURVE, HYSTERESIS, EDDY CURRENT. PRINCIPLE OF ELECTRO - MAGNETIC INDUCTION, FARADAY'S LAW, LENZ'S LAW. ELECTROSTATICS: CAPACITOR- DIFFERENT TYPES, FUNCTIONS AND USES.

B. NUMERICAL, GK & REASONING (10%): 20 NOS. OF MULTIPLE CHOICE QUESTIONS (MCQS)

C. ENGLISH KNOWLEDGE (10%): 20 NOS. OF MULTIPLE CHOICE QUESTIONS (MCQS)

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