

APPENDIX I

SCHEME AND SYLLABUS OF EXAMINATION FOR THE PURPOSE OF FILLING THE POST OF FEED MILL OPERATOR UNDER SIKKIM STATE SUB-ORDINATE FISHERIES SERVICE:

1. The mode of examination and setting up of question papers shall be both objective MCQs and Conventional types. The candidates are required to answer the objective type MCQs in the OMR Sheets and are required to follow the guidelines provided in the OMR Sheet while answering the questions.

The main (written) examination shall consist of 2 papers:-

PAPERS	SUBJECT	FULL MARKS	TIME ALLOWED
PAPER-I	General English	50	1:00 hours
	General Knowledge	30	
PAPER-II	Mechatronics	100	2:00 hours

2. SYLLABUS

PAPER-I: GENERAL ENGLISH

The question will be designed to test the candidate's understanding and command of the English language. The patterns of questions would be broadly as follows:-

- 1) Comprehension of given passage.
- 2) Grammar.
- 3) Usages and Vocabulary.
- 4) Report Writing, Essay Writing and Precis Writing

General knowledge: Knowledge of current events of local, National and International importance.

PAPER-II: MECHATRONICS

1. Digital Electronics
  - a. Review of number systems
  - b. Boolean algebra

- c. Combinational logic circuits design
- d. Introduction to sequential logic
- e. Synchronous sequential circuit design
- f. Timing and signal generating circuits
- g. Analog to digital converter & digital to analog converter

## 2. Control Systems

- a. Introduction to control system - Open loop control system, closed loop control system, control system terminology, feedback and its characteristics, linear systems, non-linear systems, introduction to Laplace transformations
- b. Control system representation
- c. Modeling of control system
- d. Components of control systems
- e. Time response analysis

## 3. Electrical Machines

- a. Transformers
- b. DC generators
- c. DC motors
- d. Importance of power factor in electrical machines
- e. Induction motors
- f. Special purpose motors

## 4. Pneumatics & Hydraulics

- a. Introduction - Fluid power – Pascal’s law, Types of fluid power- hydraulic and pneumatic- their basic elements and differences, Applications of fluid power, Advantages and disadvantages of fluid power
- b. Compressors
- c. Servicing of compressed air
- d. Valves
- e. Pneumatic actuators
- f. Pumps used in hydraulic system
- g. Hydraulic actuators
- h. Hydraulic & pneumatic circuits

## 5. Microprocessor

- a. Introduction - organization of a microcomputer system and functions of its various blocks
- b. Architecture of an 8085 microprocessor
- c. Memories and their interfacing
- d. Programming using 8085 microprocessor
- e. Instruction timings and cycles
- f. Interrupts
- g. Data transfer techniques
- h. Introduction to 8086

## 6. Manufacturing Technology

- a. Concept of manufacturing - Classification of materials: ferrous metals, non-ferrous metals, plastics, ceramics, composite materials, Categories of manufacturing process – casting, forming and shaping, machining, joining and finishing
- b. Casting process
- c. Powder metallurgy
- d. Ceramic and composite materials
- e. Welding processes
- f. Forming and shaping processes
- g. Machine tools and machining processes
- h. Unconventional machining processes
- i. Economics of machining and manufacturing

## 7. Power Electronics –

- a. Introduction, types and application of power electronics, Advantages and disadvantages, Power electronic systems, Types of power electronic converters
- b. Power semiconductor diodes and transistors
- c. Thyristors (silicon controlled rectifiers)
- d. Thyristor commutation techniques
- e. Single phase AC to DC converters (phase controlled rectifiers)
- f. Three phase AC to DC converters (phase controlled rectifiers)

## 8. Process Control

- a. Introduction to process control - Classification of process control variables, Process characteristics, Open loop and closed loop control, Control modes in closed loop control – manual control, ON-OFF control, PID control & time proportion control, Elements of process control – Process, Sensors, Final control elements and controller, Process Characteristics – Process order, dead time, process time constant, process controllability, Process gain, Process action
- b. Load distribution and its effects
- c. Analysis and design of feedback control systems
- d. Special control strategy
- e. Piping and instrumentation diagrams
- f. Process control loops
- g. Control elements

## 9. Mechatronics Design

- a. Introduction - Building blocks of mechatronic systems, Conventional systems vs mechatronic systems, Applications of mechatronic systems
- b. Sensors and actuators
- c. Mechanical elements
- d. Principles of electronic systems communication
- e. Computer control system

## 10. CNC Technology & Programming

- a. Introduction to NC technology
- b. Constructional features of CNC machines
- c. Drive system
- d. Introduction to part programming
- e. Computer numerical control (CNC)
- f. Feedback devices

11. JAVA

- a. Introduction to java - Object Oriented Programming Language, Comparison of Java with Other Languages- Java Vs C, Java Vs C++, Java Virtual Machine (JVM), Types of Java Program- Standalone Programs, Applets, Servlets, Java Architecture
- b. Data types, operators, looping and selection statements
- c. Classes, arrays and string handling
- d. Inheritance, interfaces and packages
- e. Applets and graphics
- f. Multithreaded programming
- g. AVR, PIC, ARM, 8051 microcontroller interfacing
- h. Nano-materials and nano-technology

12. Embedded Systems

- a. Embedded hardware
- b. PIC microcontroller
- c. ARM microcontroller
- d. ATMEGA 16 microcontroller

13. Industrial Automation & Control – I

- a. Automation in production system, types of automation
- b. Elements and levels of automation
- c. Numerical control production system
- d. High volume production system
- e. Assembly systems and line balancing
- f. Material handling and storage
- g. Quality control systems

14. Power Electronics – II

- a. Converters
- b. Inverters
- c. Cycloconverters
- d. Chopper
- e. Electrical drives
- f. Thyristor based circuits

15. Robotics

- a. INTRODUCTION - Degree of freedom required in a manipulator, work envelope, arm configuration, wrist configuration, Joint drive system – types, limitations, End effectors – definition, classification of end effectors, Grippers: functions, mechanical grippers – types, magnetic grippers, vacuum & adhesive gripper, considerations in gripper selection and designing
- b. Manipulator kinematics
- c. Robot control system
- d. Robot drives and power transmission systems
- e. Machine vision
- f. Robot programming language and systems
- g. Robot applications

#### 16. Industrial Automation & Control – II

- a. Control technologies in automation
- b. Group technology
- c. Flexible manufacturing systems
- d. Computer integrated manufacturing
- e. Process planning
- f. Production planning and control
- g. Industrial communication and networks

#### 17. Advanced Control Systems

- a. Introduction - Adaptive control system, Basic adaptive control scheme, Fundamental hypothesis in adaptive control, Adaptive control versus conventional feedback control, Feed forward control system
- b. Stability analysis in time domain
- c. Frequency response analysis
- d. Compensation
- e. State variable analysis

  
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