Sikkim Public Service Commission

Main Written Examination for the post of Feed Mill Operator
under Sikkim State Sub-Ordinate Fisheries Service

Time Allowed: 2.00 hours | **PAPER - II** | Maximum Marks: 100

INSTRUCTIONS TO CANDIDATES

***Read the instructions carefully before answering the questions*: -**

1. **IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS BOOKLET DOES NOT HAVE ANY UNPRINTED, TORN OR MISSING PAGES OR ITEMS. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.**
2. **Use only Black Ball Point Pen to fill the OMR Sheet.**
3. Please note that it is the candidate's responsibility to fill in the Roll Number carefully without any omission or discrepancy at the appropriate places in the **OMR ANSWER SHEET** as well as on **SEPARATE ANSWER SHEET** for Conventional Type Questions. Any omission/discrepancy will render the Answer Sheet liable for rejection.
4. Do not write anything else on the OMR Answer Sheet except the required information.
5. This Test Booklet contains 30 items (questions) in MCQ Mode to be marked in OMR Sheet. There are eight questions Q. 31 to Q. 38 carrying 4 marks each of Short Answer Type and four questions Q. 39 to Q. 42 carrying 10 marks each of Long Answer Type which have to be written in separate answer sheet provided to you.
6. All items from 1 to 30 carry 2 marks each.
7. Before you proceed to mark in the OMR Answer Sheet, you have to fill in some particulars as per given instructions.
8. After you have completed filling in all your responses on the OMR Answer Sheet and the examination has concluded, you should hand over the Answer Sheet (OMR) and separate answer sheet to the Invigilator only. You are permitted to take with you the Test Booklet.
9. **Marking Scheme**

   THERE WIL BE **NEGATIVE MARKING** FOR WRONG ANSWERS MARKED BY A CANDIDATE IN THE OBECTVE TYPE QUESTIONS

   (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, one-third of the marks assigned to the question will be deducted as penalty.

   (ii) If a candidate gives more than one answer, it will be treated as a wrong answer even if one of the given answers happens to be correct and there will be same penalty as above to the question.

   (iii) If a question is left blank. i.e., no answer is given by the candidate, there will be no penalty for that question.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

PART I

(Multiple Choice Questions)

All questions from 1 to 30 are compulsory. *(2 x 30 = 60)*

1. 2's complement of 11001011 is _____
   A. 01010111
   B. 11010100
   C. 00110101
   D. 11100010

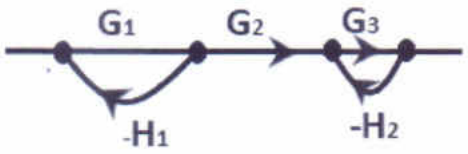
2. How many entries will there be in the truth table of a 4-input NAND gate?
   A. 6
   B. 8
   C. 32
   D. 16

3. Which semiconductor device is not a current triggering device?
   A. TRIAC
   B. MOSFET
   C. GTO
   D. Thyristor

4. In the toggle mode, a JK flip-flop has
   A. J = 0, K = 1
   B. J = 1, K = 1
   C. J = 0, K = 0
   D. J = 1, K = 0

5. Traffic light system is the example of:
   A. Open-loop system
   B. Closed-loop system
   C. Both (a) and (b)
   D. None of the above

6. Find the overall transfer function of the given signal flow graph.



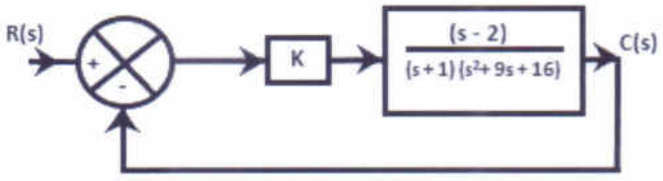
A. G1G2G3/ (1 + G1H1 + G3H2 + G3G1H1H2)

B. G1G3/ (1 + G1H1 + G3H2 + G3G1)

C. (G1G2G3 + G1H1)/ (1 + G1H1 + G3H2 + G3G1H1H2)

D. (G1G2G3 + G1H1 + G3H2) / (1 + G1H1 + G3H2 + G3G1H1H2)

7. For the given closed-loop system, the ranges of the values of K for stability is:



A. K > -19.5

B. K > 8

C. -19.5 < K < 8

D. K > 0

8. If the terminal voltage of 220-V dc generator having armature resistance of 1 ohms is 200-V. The armature current for the above machine is?

A. 20 A

B. -20 A

C. -10 A

D. 10 A

9. The conductor EMF and current are in _____ direction and developed torque is in _____ direction for generating mode.

A. same, opposite

B. same, same

C. opposite, same

D. opposite, opposite

10. Match the following group 1 items with group 2 items and select the correct option.

1. Radial motor	A. Swash plate
2. Axial motor	B. Crank shaft motor
3. Orbit	C. Vane motor
4. Low torque motor	D. Geroller motor

A. 1-B, 2-A, 3-D, 4-C
B. 1-A, 2-C, 3-B, 4-D
C. 1-C, 2- A, 3-B, 4-D
D. 1-B, 2-D, 3-A, 4-C

11. What is the function of hydraulic motor?

(i) hydraulic motor converts hydraulic oil under pressure into torque and angular displacement
(ii) hydraulic motor converts hydraulic oil under pressure into force and linear displacement
(iii) hydraulic motor converts hydraulic energy into mechanical energy
(iv) hydraulic motor converts mechanical energy into hydraulic energy

A. 1 and 4
B. 1 and 3
C. 2 and 3
D. 2 and 4

12. What happens when the distance between flange and cylinder block is varied?

A. piston displacement cannot be varied
B. variable flow rate of fluid can be achieved
C. fixed flow rate can be achieved
D. all of the above

13. The number of bits processed in a single instruction is known as?

A. Instruction Set

B. Bandwidth

C. Bandspeed

D. Instruction Speed

14. A machine language instruction format consists of

A. Operand field

B. Operation code field

C. Operation code field & operand field

D. None of the above

15. In a machine instruction format, S-bit is the

A. status bit

B. sign bit

C. sign extension bit

D. none of the above

16. The welds which do not require filler material are called _____ materials.

A. autogenous

B. autofiller

C. non-filler

D. isotropic

17. How many issues are there concerning laser welding?

A. 2

B. 3

C. 4

D. 5

18. Which of the below mentioned statements is false regarding a p-n junction diode?

A. Diodes are uncontrolled devices

B. Diodes are rectifying devices

C. Diodes are unidirectional devices

D. Diodes have three terminals

19. An SCR is a

A. four-layer, four-junction device

B. four-layer, three-junction device

C. four-layer, two-junction device

D. three-layer, single-junction device

20. What is a process control system?

A. system to keep the parameters at zero value

B. system to maintain the parameters constant

C. system to keep the parameters at highest value

D. system to check the voltage

21. What is the main objective of process control?

A. to control physical parameters

B. to control mechanical parameters

C. to control optical parameters

D. to control electrical parameters

22. In which stage the measurement system comes in contact with the measurand or the quantity to be measured?

A. Transducer Stage

B. Signal Processor Stage

C. Output Stage

D. None of the above

23. In the level of integration of Mechatronics system, an example of the first level is -

A. Fluid valves

B. Automatic machine tools

C. Industrial robots

D. Microprocessors

24. What is the function of "analysis" in the modeling and simulation phase?

A. Database for maintaining project information

B. Sub models for eventual reuse

C. Contains Numerical methods

D. To produce high-level source code

25. In CNC systems multiple microprocessors and programmable logic controllers work _____

A. in parallel

B. in series

C. one after the other

D. for 80% of the total machining time

26. In part programming, interpolation is used for obtaining _____ trajectory.

A. helicoidal

B. pentagonal

C. triangular

D. zig-zag

27. Which of the following is not a Java feature?

A. Dynamic

B. Architecture Neutral

C. Use of pointers

D. Object-oriented

28. _____ is used to find and fix bugs in the Java programs.

A. JVM

B. JRE

C. JDK

D. JDB

29. Which of the following is the design in which both the hardware and software are considered during the design?

A. platform based design

B. memory based design

C. software/hardware codesign

D. peripheral design

30. In which design activity, the loops are interchangeable?

A. Compilation

B. scheduling

C. high-level transformation

D. hardware/software partitioning

PART II

(Short Answer Type Questions)

Attempt any 5 out of the questions 31 to 38 ***(4 x 5 = 20)***

31. What is race around condition? Construct characteristic table of JK flip flop.

32. Explain compressor and their type with neat and clean diagram.

33. What is the function of $\overline{WR}$ signal on the memory chip? How many address lines are necessary for the memory chip with 2048 ×8 size?

34. What is a 'Aspiration effect' in a casting process? Explain.

35. A thyristor half-wave controlled converter has a supply voltage of 240V at 50Hz and a load resistance of 100Ω. What are the average values of load voltage and current when the firing delay angle is (a) 30^0 (b) 140^0.

36. Find $f(A) = A^{10}$ for $A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$ using state transition matrix concept.

37. What is the purpose of the control transformer in machine control systems?

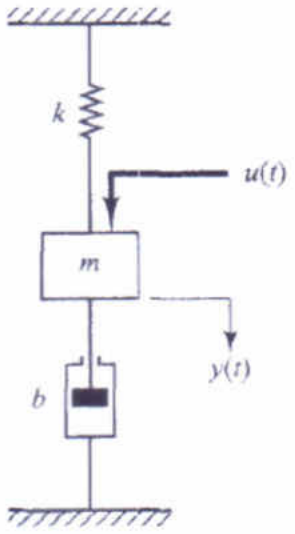
38. What are the various communication requirements between the various classes of embedded systems?

PART III

(Long Answer Type Questions)

Answer any 2 out of questions 39 to 42 ***(10 x 2 = 20)***

39. Consider the mechanical system shown in Figure. We assume that the system is linear. The external force *u(t)* is the input to the system, and the displacement *y(t)* of the mass is the output. The displacement *y(t)* is measured from the equilibrium position in the absence of the external force. This system is a single-input-single-output system. Obtain a state-space representation of the system.



40. A three-phase load is supplied from a 2.4-kV:460-V, 250-kVA transformer whose equivalent series impedance is 0.026 + j0.12 per unit on its own base. The load voltage is observed to be 438-V line-line, and it is drawing 95 kW at unity power factor. Calculate the voltage at the high-voltage side of the transformer. Perform the calculations on a 460-V, 100-kVA base.

41. Sketch the circuit diagram of a Mosfet d.c. to d.c. chopper supplying variable voltage to a resistive load. With the aid of a voltage waveform diagram, obtain an expression for the average load voltage.

42. A three-phase bridge inverter is fed from a 600 volt dc source. The inverter is operated in 180° conduction mode and it is supplying a purely resistive, star connected load with $R = 15\,{}^{ohm}/_{phase}$. Determine:

(a) The rms value of load current,

(b) The rms value of switch current,

(c) The power delivered to the load, and

(d) The average source current.

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