

Register No.:

Name :

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SIXTH SEMESTER B.TECH DEGREE EXAMINATION (S), AUGUST 2023**ROBOTICS AND AUTOMATION****(2020 SCHEME)****Course Code : 20RBT308****Course Name : Comprehensive Course Work****Max. Marks : 50****Duration : 75 Minutes****PART A****(Answer all questions. Each question carries 1 mark)**

- 1 In a four-bar linkage, if the lengths of shortest, longest and the other two links are denoted by s , l , p and q , then it would result in Grashof's linkage provided that
 - A. $l+p = s+q$
 - B. $l + p < s + q$
 - C. $l-p = s+q$
 - D. $l+s < p+q$
- 2 The acceleration of a particle at any instant has two components i.e. radial component and tangential component. These two components will be
 - A. Parallel to each other
 - B. Perpendicular to each other
 - C. Inclined at 45°
 - D. Opposite to each other
- 3 The Kutzbach criterion for determining the number of degrees of freedom (n) is (where L = number of links, j = number of joints and h = number of higher pairs)
 - A. $n = 3(L-1)-2j-h$
 - B. $n = 2(L-1)-2j-h$
 - C. $n = 3(L-1)-3j-h$
 - D. $n = 2(L-1)-3j-h$
- 4 Identify the most ideal motion for a high-speed follower
 - A. Simple harmonic motion
 - B. Constant velocity motion
 - C. Constant acceleration motion
 - D. Cycloidal motion
- 5 For a kinematic chain to be considered as mechanism
 - A. Two links should be fixed
 - B. One link should be fixed
 - C. None of the links should be fixed
 - D. There is no such criterion
- 6 A circular bar moving in a round hole is an example of
 - A. Incompletely constrained motion
 - B. Partially constrained motion
 - C. Completely constrained motion
 - D. Successfully constrained motion
- 7 The interrupt service routine for the RESET interrupt is vectored in
 - A. 0000H
 - B. 0003H
 - C. 000BH
 - D. 0013H
- 8 How many data lines are there in a 16×2 alphanumeric LCD?
 - A. 16
 - B. 8
 - C. 1
 - D. 0
- 9 AT89C2051 has RAM of:
 - A. 128 bytes
 - B. 256 bytes
 - C. 64 bytes
 - D. 512 bytes

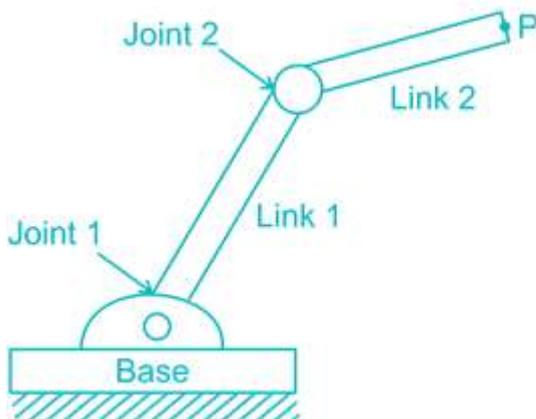
- 10 How many bytes of bit addressable memory is present in 8051 based microcontrollers?
- A. 8 bytes B. 32 bytes
C. 16 bytes D. 128 bytes
- 11 Which pin of the external hardware is said to exhibit INTO interrupt?
- A. pin no 10 B. pin no 11
C. pin no 12 D. pin no 13
- 12 RISC stands for
- A. Reduced Instruction Set Computing B. Reduced Instruction System Computing
C. All of the above D. None of the above
- 13 The frequency at which the phase crosses -180° is known as
- A. Phase margin B. Nyquist Frequency
C. Phase Cross Over Frequency D. Gain Cross Over Frequency
- 14 As unity feedback system has a forward path transfer function $G(s) = K/s(s+8)$ where K is the gain of the system. The value of K, for making this system critically damped should be
- A. 4 B. 8
C. 16 D. 32
- 15 If the damping ratio is unity, then the system is
- A. Undamped System B. Under Damped System
C. Over Damped System D. Critically Damped System
- 16 The steady state error for velocity input is given by
- A. $\frac{1}{1+K_p}$ B. $\frac{1}{K_v}$
C. $\frac{1}{K_a}$ D. All of these
- 17 Number of poles of loop transfer function lying at origin is known as
- A. Type number of the system B. Order of the system
C. All of the above D. None of the above
- 18 Which of the following is considered a time-domain technique in control systems?
- A. Routh-Hurwitz criterion B. Root locus plot
C. Bode plot D. Nyquist criterion
- 19 Homogeneous coordinate allows you to
- A. combine transformation B. eliminate need of intermediate calculations
C. saves time and memory D. all of these
- 20 What is the standard form of ZMP?
- A. Zero Memory Point B. Zero Momentum Point
C. Zero Main Point D. None of the above
- 21 According to Denavit – Hartenberg notations, link and joint parameters represent
- A. The relative positions of neighboring links and structure of a link respectively.
B. The structure of a link and relative positions of neighboring links respectively
C. The structure of a link only D. The relative positions of neighboring links only

- 22 In a rack and pinion system, rack is an element moving in translational direction and pinion is a rotary gear. Which one of the following statements is correct.
- A. Translational acceleration is directly proportional to the moment of inertia of pinion. B. Translational acceleration is inversely proportional to the moment of inertia of pinion.
- C. Angular acceleration is inversely proportional to the torque on piston shaft. D. Translational velocity is directly proportional to the moment of inertia of pinion.
- 23 What is the standard form of DOF?
- A. Degree of Finance B. Degree of Freedom
C. Degree of Fail D. None of the above
- 24 Which one of the following robots also called spherical robot?
- A. SCARA B. Delta
C. Polar D. None of the above
- 25 What will the numbers in 4/2 valve mean?
- A. Four positions and 2 ways B. Four ways and 2 position
C. Two positions and 2 ways D. Four positions and four ways
- 26 What is the primary function of timers and counters in a PLC?
- A. To provide digital inputs to the PLC B. To provide analog outputs from the PLC
C. To control the timing of events in the system D. To monitor the performance of the system
- 27 Which of the following is an advantage of using an electric actuator over a hydraulic or pneumatic actuator?
- A. Lower initial cost B. Ability to operate in high-temperature environments
C. Higher accuracy and repeatability D. Greater force or torque output
- 28 In which layout manufacturing is done according to machine arrangement?
- A. GT layout B. Product layout
C. Process layout D. Hybrid layout
- 29 Which of the following is a category of proximity sensors?
- A. Capacitive sensors B. Linear sensors
C. Tilt sensors D. Flow sensors
- 30 An OR function implemented in ladder logic uses:
- A. Normally-closed contacts in series B. Normally-open contacts in series
C. A single normally-closed contact D. Normally-open contacts in parallel

PART B

(Answer all questions. Each question carries 2 marks)

- 31 Calculate the degrees of freedom of a linkage having 4 links, 4 numbers of lower pair, and no number of higher pairs.
A. 1 B. 2
C. 3 D. 4
- 32 Determine the number of simple hinges in a six-link mechanism having single degree of freedom.
A. 5 B. 6
C. 7 D. 8
- 33 In the instruction "MOV TH1,#-3", what is the value that is being loaded in the TH1 register?
A. 0xFCH B. 0xFBH
C. 0xFDH D. 0xFEH
- 34 Pseudo instruction is given to
A. Loader B. Linker
C. Compiler D. Assembler
- 35 For the system, $C(s)/R(s) = 16/(S^2+8S+16)$. The nature of the response will be
A. Overdamped B. Underdamped
C. Critically damped D. None of the mentioned
- 36 The given characteristics equation $S^4+S^3+2S^2+2S+3=0$ has:
A. Zero root in the S-plane B. One root in the RHS of S-plane
C. Two roots in the RHS of S-plane D. Three roots in the RHS of S-plane
- 37 For a two degree of freedom planar RR manipulator as shown in the figure, the length of the links 1 & 2 are 40cm & 20cm respectively. If the base joint is located at the origin, then which of the given points are not possible for point P.



- A. (20,30) B. (-30,-20)
C. (0,10) D. (50,0)

- 38 Which one of the following statements are false regarding rotation matrix.
- A. Each row/column of a rotation matrix is a unit vector
 - B. Inverse of a rotation matrix is nothing but its transpose
 - C. Rotation matrices are commutative in nature.
 - D. The inner (dot) product of each row of a rotation matrix with each other row becomes equal to zero.
- 39 Which of the following is not the method of part family formation
- A. Visual inspection method
 - B. Automatic product sorting
 - C. Parts classification & coding
 - D. Production flow analysis
- 40 Which among the following fluid parameters are not controlled by the control valves?
- A. Pressure
 - B. Rate of flow
 - C. Speed
 - D. Direction of flow