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Name:

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (R,S) Examination April 2025 (2019 Scheme)

### **Course Code: RAT 308 Course name: COMPREHENSIVE COURSE WORK**

Max. Marks: 50

3.

4.

Duration: 1Hour

Pages: 6

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Instructions: (1) Each question carries one mark. No negative marks for wrong answers (2) Total number of questions: 50 (3) All questions are to be answered. Each question will be followed by 4 possible answers of which only ONE is correct. (4) If more than one option is chosen, it will not be considered for valuation.

#### What is a kinematic pair in the context of mechanisms? 1.

a) A set of two or b) A connection c) A type of d) A method of between two links hydraulic system calculating forces more gears in mechanisms that allows relative motion

#### 2. Which of the following best describes a four-bar linkage?

a)	A mechanism with three links and	b)	b) A planar mechanism		A type of gear train with four	d)	A system with fou degrees of	
	two joints		consisting of four links connected by		gears		freedom	
			four joints					
Kut	zbach's formula is u	sed t	o determine					

a)	The velocity of a link in a mechanism	b)	The degrees of freedom of a planar linkage	c)	The acceleration of a point on a link	d)	The static force in a kinematic pair
In a	a slider-crank mecl	hanis	sm, the crank is				

a) A rotating disk b) A sliding link that A rotating link A fixed link that c) d) that drives the reciprocates connected to a supports the slider fixed pivot and a slider connecting rod

5. Which of the following is a common application of cam-follower mechanisms?

- Converting rotary b) Transmitting a) c) Reducing speed d) Connecting motion into power through in a mechanical different parts of linear motion gears system a hydraulic system
- 6. The mobility or degrees of freedom (DoF) of a mechanism refers to:

	a)	The number of independent movements allowed by the mechanism	b)	The total number of links in the mechanism	c)	The speed at which the mechanism can operate	d)	The amount of force the mechanism can withstand				
7.	Which of the following describes the inverse pose problem of a 3R planar manipulator?											
	a)	Determining the velocities of the joints given the end effector's velocity	b)	Finding the joint angles required to achieve a specific end effector position	c)	Calculating the acceleration of the end effector given the joint accelerations	d)	Analyzing the static forces at each joint				
8.	In v	velocity analysis, Co	riolis	s acceleration is:								
	a)	The acceleration due to change in direction of velocity	b)	The acceleration due to change in speed	c)	The additional acceleration experienced by a point on a rotating body due to its rotational motion	d)	The acceleration due to gravitational forces				
9.	Euler's equation for rigid body rotation is used to calculate:											
10	a)	Linear displacement of a rigid body	b)	The moments of inertia	c)	The static forces in a mechanism	d)	The rotational dynamics of a rigid body				
10.	Rot	a) Represent the b) Describe the c) Calculate the d) Determine the										
	a)	Represent the position of a point in space	b)	Describe the orientation of a reference frame	c)	Calculate the linear velocity of a link	d)	Determine the forces at a joint				
11	Int	the 8051 microcont	rolle	r, how many I/O po	orts a	re available?						
	a)	2	b)	4	c)	6	d)	8				
12	Which of the following is a Special Function Register (SFR) in the 8051 microcontroller?											
	a)	ACC	b)	Timer 0	c)	RAM	d)	ROM				
13	The 8051 microcontroller uses which type of architecture?											
14	a)	Harvard architecture	b)	von Neumann architecture	c)	RISC architecture	d)	CISC architecture				
14	VV I	lich instruction is u	sea	for addition in 8051	asse	mbly language:	I)					
	a)	SUBB	b)		c)	ADD	d)	MUL				
15	Wh	hat is the size of the	inte	rnal RAM of the 80	51 m	ucrocontroller?						
	a)	64 bytes	b)	128 bytes	c)	256 bytes	d)	512 bytes				
16	Wh	nich of the following nmunication in em	g cor bedd	nmunication protoc led systems?	ols is	s commonly used f	or se	rial				

	a)	I2C	b)	SPI	c)	RS232	d)	USB		
17	In embedded systems, what does RTOS stand for?									
18	a) Whi	Real Time Operating System ich addressing mode is	b) s use	Real Time Output System d in the instruction MC	c) DV A, i	Real Time Operations System #55H in 8051 assem	d) bly lar	Real Time Organization System nguage?		
	Disect addressing (b) Indirect addressing (b) Investigate (b) Desister									
19	a) Wh	Direct addressing	b) fati	mer in the 8051 mic	c) croco	addressing	d)	addressing		
17	a)	To count external	b)	To generate time	c)	Both a and b	d)	To control serial		
	1	events	, í	delays			D.C.	communication		
20	In t	the context of the 80	)51 i	nicrocontroller, wh	at do	es the acronym A	DC st	tand for?		
21	a) Wh	Analog to Digital Converter	b)	Advanced Digital Circuit	c)	Analog Digital Compiler rol system?	d)	Active Digital Control		
21	••••	To increase the	h)	To reduce the	contra a)	To improve the	<b>d</b> )	To dooranse the		
	a)	system gain	0)	system complexity	C)	stability and accuracy of the system	u)	system's response time		
22	In a signal flow graph, which of the following represents the relationship between nodes?									
	a)	Branch	b)	Loop	c)	Path	d)	Gain		
23	Which of the following is a characteristic of the transient response of a first-order system									
	to a a)	Oscillatory behavior	b)	Exponential approach to a steady-state value	c)	Quadratic rise	d)	Sinusoidal response		
24	Wh	at is the steady-star	te er	ror for a type 0 syst	tem s	ubjected to a unit	step	input?		
	a)	Zero	b)	Finite non-zero	c)	Infinite	d)	Depends on system parameters		
25	Wh	ich criterion is used	d to	determine the stabi	lity o	f a system using it	s cha	racteristic		
	a)	Nyquist criterion	b)	Bode plot	c)	Routh-Hurwitz criterion	d)	Root locus		
26	In root locus analysis, what is the effect of adding a pole to the system?									
	a)	It shifts the root locus to the right	b)	It shifts the root locus to the left	c)	It makes the system more	d)	It has no effect on the root locus		
27	Wh	at does the phase n	narg	in of a system indic	ate?					
	a)	The amount by which the gain can be increased	b)	The amount by which the phase can be decreased	c)	The amount by which the gain can be decreased before the	d)	The amount by which the phase can be increased before the		

of a system? a) Lead compensator b) Lag compensator c) Lead-lag d) Prop	portional pensator
compensator	pensator
29 What is the state-space representation of a system?	
<ul> <li>a) A method to</li> <li>b) A graphical</li> <li>c) A mathematical</li> <li>d) A plo</li> <li>represent the</li> <li>representation of</li> <li>system's</li> <li>differential</li> <li>equations</li> <li>30</li> </ul>	ot of system onse over
a) The delay in b) The delay in the c) The delay d) The delay in the system response output signal introduced by trans due to processing compared to the additional system in the time input signal components	delay due to sportation lag e system
<ul> <li>Which type of robot is designed to interact with the physical environment and can perform welding or assembling?</li> <li>a) Mobile Robots</li> <li>b) Manipulators</li> <li>c) Aerial Robots</li> <li>d) Legg</li> </ul>	n tasks like ged Robots
32 What component of a robotic manipulator is responsible for movement and positioning?	
a) Links b) Joints c) Actuators d) Sens	ors
33 In a robotic system, what does a sensor primarily do?	
a) Provides b) Processes control c) Collects data d) Trans movement commands from the environment	sforms energy
34 Which of the following robot configurations consists of three revolute joints?	
a) PPP b) RPP c) RRP d) RRR	
35 What is the main feature of SCARA robots?	
a)High-speedb)High payloadc)Ability to operated)Autooperation for assembly taskscapacity for heavy liftingin extremenavig36Which type of end effector uses suction to hold objects?assembly tasksassembly tasks	onomous gation abilities
a) Mechanical b) Magnetic grippers c) Vacuum grippers d) Adhe	esive grippers
37 What is the Denavit-Hartenberg (D-H) representation used for in robotics?	
a) Controlling b) Representing joint c) Programming d) Designation actuator speed parameters and link sensor data effective collection	gning end ctors

38 Which trajectory planning method involves creating a path with smooth transitions using cubic polynomials?

	a)	Linear trajectory with parabolic blends	b)	Cartesian space planning	c)	Cubic polynomial	d)	Point to point planning			
39	In th	ne context of kinemat	ics, w	/hat does a "closed kii	nemat	ic chain" refer to?					
	a)	A series of links with fixed end points forming a loop	b)	A single sequence of links connected in series	c)	A chain with fewer degrees of freedom	d)	A mechanism without any joints			
40	Wha	at is a key advantage o	of usi	ng a concurrent wrist	in a 3I	DOF manipulator?					
	a)	Increased payload capacity	b)	Enhanced precision in end effector positioning	c)	Simplified control algorithms	d)	Reduced energy consumption			
41	Whi	ich type of sensor is u	sed to	o detect the presence	ofme	tal objects without p	physica	al contact?			
	a)	Capacitive sensor	b)	Photoelectric sensor	c)	Inductive sensor	d)	Thermoelectric sensor			
42	What is the main function of a resolver in rotary position sensing?										
	a)	Measure temperature changes	b)	Detect linear position	c)	Convert angular position to an electrical signal	d)	Measure proximity			
43	Which sensor type is commonly used for high-precision thickness measurement in industrial applications?										
14	a)	Laser interferometer	b)	LVDT	c)	Photoelectric sensor	d)	Capacitive sensor			
44	vvn		r 1 \			c ·	1	<b>~</b> · · · ·			
	a)	position	6)	displacement	c)	temperature changes	d)	Gauging proximity			
45	Whi	ich of the following ac	tuato	ors is typically used for	r appli	cations requiring hig	h forc	e and precision?			
	a)	Electrical actuator	b)	Hydraulic actuator	c)	Pneumatic actuator	d)	Magnetic actuator			
46	In an automated inspection system, which sensor type is used for non-contact measurement?										
	a)	Strain gauge	b)	Thermoelectric sensor	c)	Photoelectric sensor	d)	Linear potentiometer			
47	Which element of a CNC system is responsible for moving materials and parts into position?										
	a)	Controller	b)	Actuator	c)	Material handling system	d)	Sensor			
48	What does a ladder diagram represent in the context of PLC programming?										
	a)	The physical layout of sensors	b)	The sequence of operations and control logic	c)	The power distribution network	d)	The hydraulic circuit design			
49	Whi auto	ch method is used to omation?	deve	lop sequential contro	l for m	ultiple actuator syst	ems in	pneumatic			
	a)	PID control	b)	Cascade method	c)	Fuzzy logic	d)	Neural networks			

What is the primary advantage of using a Variable Frequency Drive (VFD) in motion control systems?

a) Improved power b) Er efficiency te m

50

b) Enhanced temperature measurement \*\*\*

- c) Increased d) proximity sensing range
- Reduced mechanical wear