

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Sixth Semester B.Tech Degree Regular and Supplementary Examination June 2023 (2019 Scheme)

**Course Code: RAT308****Course name: COMPREHENSIVE COURSE WORK**

Max. Marks: 50

Duration: 1 Hour

- 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.

1. In a rigid link AB, the point B is moving with respect to A. Then the acceleration of B will be equal to
 

a) acceleration of A $\times$ distance AB	b) (acceleration of A) $\div$ distance AB	c) vector sum of acceleration of A and acceleration of B, relative to A	d) acceleration of A $\times$ square of distance AB.
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2. Industrial robots are generally designed to carry which of the following co ordinate systems
 

a) cartesian coordinate sytem	b) polar coordinate system	c) cylindrical coordinate system	d) All of these
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3. A body remains in equilibrium if \_\_\_\_\_.
 

a) inertia force is applied in the same direction to the resultant force	b) inertia force is applied in the direction opposite to the resultant force	c) inertia force is applied in the direction perpendicular to the resultant force	d) inertia force is applied in the direction Parallel to the resultant force
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4. A cam with a roller follower would constitute following type of pair
 

a) lower pair	b) higher pair	c) close pair	d) cam pair
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5. The Coriolis component of acceleration exists only whenever a point
 

a) moves along a circular path	b) moves in a straight line	c) moves along a straight line which has rotational motion	d) none of these
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6. Which component of acceleration is directed towards the centre of rotation of a revolving body?
 

a) Tangential	b) Coriolis	c) Central	d) Centripetal
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7. A slider moves with uniform velocity  $v$  on a revolving link of length  $r$  with angular velocity  $\omega$ . The Coriolis acceleration component of a point on the slider relative to a coincident point on the link is equal to

- a)  $2v\omega$  parallel to link      b)  $2v\omega$  perpendicular to link      c)  $2r\omega$  perpendicular to link      d)  $2v\omega$  parallel to link
8. If there are L number of links in a mechanism, then number of possible inversions is equal to  
 a) L      b) L-1      c) L+1      d) L+2
9. A planar mechanism has 8 links and 10 rotary joints. The number of degrees of freedom of the mechanism is  
 a) 0      b) 1      c) 2      d) 3
10. Choose the correct relationship between angular acceleration, torque and moment of inertia.  
 a) Angular acceleration = Torque  $\times$  Moment of inertia  
 b) Angular acceleration = Torque / Moment of inertia  
 c) Moment of inertia = Angular acceleration  $\times$  Torque  
 d) None of these
11. The register that is used for accessing external data memory is  
 a) DPTR      b) TCON      c) SMOD      d) IP
12. Find the machine cycle for 8051 if XTAL frequency is 12 MHz  
 a) 90.42  $\mu$ s      b) 1.085  $\mu$ s      c) 1.0  $\mu$ s      d) 12  $\mu$ s
13. What is the operation for Timer Mode 1 in 8051?  
 a) 13-bit timer mode, 8-bit timer/counter THx and TLx as 5-bit prescaler  
 b) 16-bit timer mode, 16-bit timer/counter THx and TLx are cascaded, no prescaler  
 c) 8 bit auto reload mode, 8 bit auto reload timer/counter, THx holds a value which is to be reloaded to TLx each time it overflows  
 d) Split timer mode status
14. Which register bank is selected by default on reset of 8051  
 a) RB0      b) RB1      c) RB2      d) RB3
15. Stack Pointer of 8051 is of \_\_\_ wide and it is loaded with the default value of \_\_\_ after reset  
 a) 8-bit, 07H      b) 16-bit, 00H      c) 16-bit, 08H      d) 8-bit, 00H
16. The only way to terminate the power down mode of 8051 is to  
 a) CLEAR      b) RESET      c) HOLD      d) HALT
17. When the microcontroller executes some arithmetic operations, then the flag bits of which of the following register are affected?  
 a) DPTR      b) PSW      c) PC      d) SP
18. The Program Counter in an 8051 architecture is a \_\_\_\_\_

- a) 8-bit register      b) 16-bit register      c) 32-bit register      d) none of these
- 19 The higher and lower bytes of a 16-bit register DPTR are represented respectively as  
 a) LDPTR and HDPTR      b) DPTRL and DPTRH      c) DPH and DPL      d) HDP and LDP
- 20 Which of the following can be used for long distance communication?  
 a) I2C      b) Parallel port      c) SPI      d) RS232
- 21 Which of the following are the not characteristics of the closed loop systems?  
 a) It does not compensate for disturbance      b) It reduces the sensitivity of plant-parameter variations      c) It does not involve output measurements      d) It does not has the ability to control the system transient response
- 22 Feedback control system is basically  
 a) High pass filter      b) Low pass filter      c) Band pass filter      d) Band stop filter
- 23 Let  $x(t)$  be a continuous-time, real valued signal band-limited to  $F$  Hz. The Nyquist sampling rate in Hz, For  $y(t) = x(0.5t) + x(t) - x(2t)$  is  
 a)  $F$       b)  $2F$       c)  $4F$       d)  $8F$
- 24 Which of the following transfer function will have the greatest maximum overshoot?  
 a)  $9/(s^2+2s+9)$       b)  $16/(s^2+2s+16)$       c)  $25/(s^2+2s+25)$       d)  $36/(s^2+2s+36)$
- 25 When the unit step response of a unity feedback control system having forward path transfer function  $G(s) = 80/s(s+18)$ ?  
 a) Overdamped      b) Critically damped      c) Under damped      d) Undamped oscillatory
- 26 Assertion (A): It is desirable that the transient response be sufficiently fast and sufficiently damped.  
 Reason (R): Oscillations are not tolerated in the transient response.  
 a) Both A and R are true but R is not the correct explanation of A      b) Both A and R are true but R is correct explanation of A      c) A is true and R is false      d) A is false and R is true
- 27 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
- 28 Rate mode controller is also known as \_\_\_\_\_ controller mode.  
 a) Anticipatory      b) Delay      c) Integral      d) Derivative
- 29 Time required for the step response to go from 90% of the final value to 10% of the final value is called -----  
 a) Rise Time      b) Fall Time      c) Peak time      d) Slew rate
- 30 Which is the strongest method for stability analysis and transient analysis of systems?  
 a) Bode plot      b) Nyquist plot      c) Routh- Hurwitz criterion      d) Root locus

- 31 The \_\_\_\_\_ represents the portion of space around the base of the manipulator that can be accessed by the arm endpoint.  
 a) work envelope    b) work volume    c) work space    d) trajectory
- 32 The diameter of the piston of a pneumatic gripper is \_\_\_\_\_ proportional to the required actuating force and \_\_\_\_\_ proportional to the factory air pressure.  
 a) directly, directly    b) directly, inversely    c) inversely, directly    d) inversely, inversely
- 33 A universal joint is a combination of  
 a) three intersecting revolute joints    b) two intersecting revolute joints    c) one revolute and one prismatic joint    d) three prismatic joints
- 34 Which application is not suitable for continuous path robot?  
 a) Arc welding    b) Spot welding    c) Spray painting    d) Floor cleaning
- 35 The arm in the gantry robot is of \_\_\_\_\_ type whose base is mounted \_\_\_\_\_.  
 a) cartesian, overhead    b) cartesian, on the floor    c) cylindrical, overhead    d) cylindrical, on the floor
- 36 The \_\_\_\_\_ force is the \_\_\_\_\_ force that must be applied to a stationary load.  
 a) dynamic maximum    b) dynamic minimum    c) static, maximum    d) static, minimum
- 37 The \_\_\_\_\_ robot is suitable for lifting heavy loads because of its \_\_\_\_\_ structure.  
 a) articulated, human arm like    b) rectangular, human arm like    c) rectangular, rigid    d) articulated, flexible
- 38 When cleanliness is important in an application, \_\_\_\_\_ drives should not be used.  
 a) pneumatic    b) dc motor    c) electric    d) hydraulic
- 39 Robotic subsystems are  
 a) motion, recognition and control subsystems    b) motion, recognition and vision subsystems    c) motion and control subsystems    d) None of these
- 40 The individual bodies that make up a robot are called  
 a) links    b) joints    c) actuators    d) sensors
- 41 Which of the following converts linear displacement from a mechanical reference into a proportional electrical signal containing phase and amplitude information?  
 a) CRO    b) LVDT    c) RVDT    d) None of these
- 42 Resolver works on the principle of \_\_\_\_\_.  
 a) Hall effect    b) Direct and Inverse kinematics    c) Electromagnetic induction    d) Control signals
- 43 At time  $t$ , the excitation voltage to a resolver is 24V. The shaft angle is  $90^\circ$ . The output signals from the resolver  $V_{s1}$  and  $V_{s2}$  will be  
 a) 12 V and 0 V    b) 12 V and 12 V    c) 24 V and 12 V    d) 24 V and 0 V

- 44 LIDAR is \_\_\_\_\_  
a) Active device      b) Passive device      c) Insulating device      d) None of the mentioned
- 45 Role of sensors in industrial automation  
a) To monitor and measure physical quantities      b) To process data and generate reports      c) To control robotic arms and machinery      d) To execute computer programs for manufacturing processes
- 46 Which proximity sensor detects metal objects?  
a) Capacitive Proximity Sensor      b) Inductive Proximity Sensor      c) Magnetic Proximity Sensor      d) Ultrasonic Proximity Sensor
- 47 Which type of lens is generally used in the PIR sensors?  
a) Concave lens      b) Convex lens      c) Bifocal lens      d) Fresnel Lens
- 48 Thermocouple cannot be used to measure \_\_\_\_\_  
a) Temperature of gas      b) Temperature of liquid      c) IR radiation      d) None of the mentioned
- 49 In photo emissive transducers, electrons are attracted by \_\_\_\_\_  
a) Cathode      b) Anode      c) Grid      d) Body
- 50 A combination of equipment and controls which handles, stores and retrieves materials with precision, accuracy and speed under a defined degree of automation is known as \_\_\_\_\_  
a) Automated storage and retrieval system (AS/RS)      b) Flexible manufacturing system      c) Automated guided vehicle      d) None of the above

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