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UNIVERSITI TUN ABDUL RAZAK

FINAL EXAMINATION

NOVEMBER 2023

COURSE TITLE	**ADVANCED TECHNOLOGY IN INDUSTRY**
COURSE CODE	**RCIT1323**
DATE/DAY	**16 FEBRUARY 2024 / FRIDAY**
TIME/DURATION	**03:00 PM - 05:00 PM / 02 Hour(s) 00 Minute(s)**

INSTRUCTIONS TO CANDIDATES :

1. Please read the instruction under each section carefully.
2. Candidates are reminded not to bring into examination hall/room any form of written materials or electronic gadget except for stationery that is permitted by the Invigilator.
3. Students who are caught breaching the Examination Rules and Regulation will be charged with an academic dishonesty and if found guilty of the offence, the maximum penalty is expulsion from the University.

(This Question Paper consists of **9** Printed Pages including front page)

*****DO NOT OPEN THE QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO*****

This question paper contains of TWO (2) sections in this examination paper. Please answer ALL questions in the answer booklet provided. [100 MARKS]

SECTION A (60 Marks)

There are THIRTY (30) questions this part of the examination paper. Answer ALL questions in the answer booklet.

1. What is a Smart Factory?

   A. A factory that produces only high-tech products.
   B. A manufacturing facility that incorporates advanced technologies for automation and data exchange.
   C. A factory with a focus on manual labor.
   D. A factory designed for low-volume production.

2. Which technology is fundamental to the concept of a Smart Factory?

   A. Steam power.
   B. Hydraulic Systems
   C. Assembly lines.
   D. Artificial Intelligence (AI)

3. What is the main goal of a Smart Factory? .

   A. Minimize automation
   B. Maximize manual labour
   C. Increase efficiency through connected and intelligent systems.
   D. Reduce the use of digital technologies.

4. What is the primary advantage of predictive maintenance in a Smart Factory?

   A. Increased downtime.
   B. Cost savings through timely equipment maintenance.
   C. Predictive maintenance is not relevant in Smart Factories.
   D. Dependency on reactive maintenance.

5. What role does 3D printing play in Smart Factories?

   A. 3D printing is not used in Smart Factories.
   B. Reduces customization options.
   C. Enables rapid prototyping and customized production.
   D. Slows down the production process.

6. In the context of manufacturing, what does the term "SCM" refer to?

   A. System Control Module
   B. Supply Chain Management
   C. Software Configuration Management
   D. Security Compliance Measure

7. A digital twin is a virtual model designed to accurately reflect a _____ .

   A. database
   B. location
   C. concept
   D. physical object

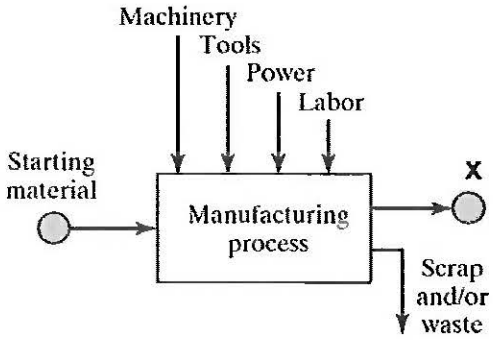
8. Which statement does **NOT** reflect the benefit of a virtual twin?

   A. short life span
   B. run simulations
   C. study performance issues
   D. generate possible improvement

9. Which is **NOT** an example of CIM (Computers in Manufacturing)

   A. Automated machine tools
   B. Industrial waste
   C Industrial robots
   D. Automated storage handling

Question 10 to 11 refers to diagram below:
The diagrams below represent the activities in a manufacturing factory.



10. "X" refers to _____ .

A. supplier delivery of material
B. database of all transactions
C. completed part or product
D. None of the above

11. The manufacturing process deals with transformation of material by _____ .

A. adding value to the material
B. only recycling material
C. providing substandard material
D. None of the above

12. Inspection is examination of the product and its components to determine whether they conform to _____.

A. Internal specification
B. design specification
C. supplier requirement
D. None of the above

13. Which is **NOT** a production performance metrics?

A. Production rate
B. Utilization
C. Suppliers
D. None of the above

14 _____ is defined as the maximum rate of output that a production facility (or production line, or group of machines) is able to produce under a given set of operating conditions.

A. Product mix
B. Production premium
C. Utilization
D. Production capacity

15. The use of augmented reality allows users to visualize graphics information _____ .

A. completely replacing the rea world with virtual world
B. as a database of vibrant images
C. superimposed on real elements/model.
D. none of the above

16. In Augmented Reality (AR), what role do smart glasses play?

A. Completely replace the real world
B. Enhance the real world with digital information
C. Simulate virtual environments
D. Track physical objects

17. In the context of Industry 4.0, a humanoid generally refers to _____ .

A. a robot or robotic system designed to resemble and perform tasks similar to those of a human
B. a robot or robotic system designed to resemble and perform tasks similar to those of a superhuman
C. a real-time computer designed to perform tasks that is new and dangerous
D. None of the above

18. Hand guiding in human-robot collaboration refers to a method _____ .

A. A where humans create software that guides the robots
B. where a human operator manually guides or directs the movements of a robot
C. where robots use machine learning to do extremely difficult tasks
D. none of the above.

19. Which does **NOT** describe learning algorithms in human-computer interaction?

A. enabling robots to adapt to human behavior
B. understand user preferences
C. robots observe human behavior and learn from it
D. enabling robots to completely replace all humans in the tasks

20. _____ techniques enable robots to understand and respond to natural language commands.

A. Robotics
B. NLP (Natural Language Processing)
C. Observational Learning
D. None of the above

21. Which is **NOT** a benefit of cloud manufacturing and the connected factory?

A. Flexibility to scale their operation
B. Cost Savings
C. Global Collaboration
D. Robot-human interactions

22. IoT sensors and devices in factories can be used to collect _____.

A. data from data warehouse
B. real-time data from equipment and machines
C. raw material for fast and efficient processing
D. parcels for warehouse and logistics

23. A/an _____ refers to a manufacturing facility where various devices, machines, and systems are interconnected through the IoT and network technologies

A. Warehouse
B. connected factory
C. supply chain
D. OEM

24. IoT sensors can predict equipment failures and schedule maintenance activities proactively, reducing downtime is known as _____.

A. augmented reality
B. predictive maintenance
C. firewall
D. intrusion detection system

25. How is asset criticality determined in the context of preventive maintenance?

A. Random selection of assets for maintenance
B. Based on the age of the equipment
C. Identification of assets with the highest impact on production, safety, and operational goals
D. By conducting a survey among maintenance personnel

26. What role does a Computerized Maintenance Management System (CMMS) play in preventive maintenance?

A. It performs preventive maintenance tasks automatically.
B. It helps streamline preventive maintenance scheduling, automate work order generation, and facilitate record-keeping.
C. It is only used for reactive maintenance.
D. It tracks employee attendance in maintenance activities.

27. What is the primary advantage of preventive maintenance over reactive maintenance?

A. Lower upfront costs
B. Minimal need for skilled personnel
C. Reduced unexpected breakdowns and downtime
D. Faster response time to equipment failures

28. What is the primary goal of machine learning within the field of Artificial Intelligence (AI)?

A. To automate routine tasks in industries
B. To develop machines that can think and reason like humans
C. To design robots with advanced motor skills
D. To create algorithms that can learn from data and improve over time

29. Which component is essential for enabling a robot to sense and interact with its environment?

A. Microprocessor
B. Actuator
C. Sensor
D. Power source

30. What concept in the future of AI involves the development of AI systems that can self-improve, adapt, and learn without explicit programming, drawing inspiration from the human brain's ability to continuously learn and evolve?

    A. Deep Learning
    B. Autonomous Intelligence
    C. Evolutionary Algorithms
    D. Artificial General Intelligence (AGI)

SECTION B **(40 Marks)**

There are TWO (2) questions in this part of the examination paper. Answer ALL question in the answer booklet.

QUESTION 1

(a) Discuss the role of Augmented Reality (AR) and Virtual Reality (VR) in transforming the manufacturing industry. (10 marks)

(b) Provide **TWO (2)** examples of successful implementations and adoption of AR. (4 marks)

(c) Provide **TWO (2)** examples of successful implementations and adoption of VR. (4 marks)

QUESTION 2

(a) Examine the concept of predictive maintenance and its significance in industrial settings. (10 marks)

(b) Predictive maintenance and traditional reactive maintenance represent two distinct approaches to managing and maintaining industrial equipment. Describe **THREE (3)** key differences between the two. (12 marks)

***** END OF QUESTION PAPER *****