Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Program: MBA Power Management — **Semester –** I
Subject (Course): IT Applications in Energy Sector — **Max. Marks:** 100
Course Code : DSIT 7003 — **Duration:** 3 hrs.
No. of page/s: 5

Section A
Attempt all questions

		Marks	CO
Q 1	Name any 4 modules of SAP	**2**	**CO1**
Q2	Complete the abbreviations 1. OMS 2. PESTEL 3. IOT 4. SCADA	**2**	**CO1**
Q3	**I. Which of the following will not cut information?** a. Pressing Ctrl + C b. Selecting Edit>Cut from the menu c. Clicking the Cut button on the standard d. Pressing Ctrl+X	**2**	**CO1**
Q4	II. **How do you insert a row?**	**2**	**CO1**

	a. Right-click the row heading where you want to insert the new row and select Insert from the shortcut menu b. Select the row heading where you want to insert the new row and select Edit >Row from the menu c. Select the row heading where you want to insert the new row and click the Insert Row button on the standard toolbar d. All of the above		
Q5	Give 2 examples of IT application in Power sector	**2**	**CO1**
Q6	Give 2 examples of OT application in Power Sector	**2**	**CO1**
Q7.	Name 2 statistical tools that can be used for demand forecasting in power sector	**2**	**CO1**
Q8	What is DERS?	**2**	**CO1**
Q9	What is MDMS?	**2**	**CO1**
Q10	Give 2 examples of PPP models	**2**	**CO1**
SECTION B			
Q11	Give 5 points with respect to importance of Business Analytics.	**5**	**CO2**
Q12	Name the stepwise process of Business Analytics	**5**	**CO2**
Q13	What are the characteristics of Big Data?	**5**	**CO2**
Q14	Explain any 2 of business models that can be used by Utilities who enhance the their revenue flow	**5**	**CO2**
SECTION-C **Each Question carries 10 Marks.**			
Q15	What is Digital Power Plant? How it can be implemented with a suitable example ?	**10**	**CO3**
Q16	What were the key challenges and trade-offs involved in IT implementation in power sector?	**10**	**CO3**

	Or Explain PPP model. How it can be implemented in Power Distribution Sector		
Q17	Explain any one of the SAP modules.	**10**	**CO3**

Section D
Attempt all Questions after going through Case study given below

Indian electricity sector has witnessed tremendous growth in its energy demand, generation capacity, and transmission and distribution networks. Electrical power systems would appear poised for a revolution. Yet, the pathway to transformation is highly sensitive to each local situation and its technical, economic, and political factors. While rapid cost reductions have changed the economic landscape for what is feasible, established asset bases and their supporting business models and regulatory frameworks generate significant inertia in the most power systems.

While the 'utility of the future' can be largely captured by the dynamic between regulation, technology innovation, and business model evolution, the 'power system of the future' is driven by a more complex set of features. The regulatory utility dynamic is still a dominant component. However, the full complex and dynamic system responds to a broader set of cross cutting trends like renewable energy cost reductions, innovations in data, intelligence, and system optimization. Energy security, reliability and resilience goals, evolving customer engagement, increased interactions with other sectors, local and global environmental concerns over air emissions, energy access imperatives, increasingly diverse participation in power markets, revenue and investment challenges.

Keeping pace with the recent technological advancements, it is deploying new types of devices and Information Technology (IT) infrastructure, adopting new monitoring, control and energy management tools, and aiming at fast deployment of smart grid concepts at distribution as well as transmission level. Electricity, being a concurrent subject in India, both central government and state governments are responsible for its growth, operation and control. The Central Government frames overall regulations whereas each state government formulates their policies within the overall regulatory framework. There are separate utilities owning generation, transmission and distribution. Ministry of Power, Government of India deals with perspective planning, policy formulation, processing of projects for investment decisions, monitoring and implementation of power projects, training and manpower development, administration and enactment of legislation in regard to the power generation, transmission and distribution. In most advanced countries, power utilities have made major gains in term of productivity, efficiency, reliability and commercial management through the modern use of IT tools. IT should be utilized to minimize human interface in commercial processes to minimize human errors and willful mistakes.

IT provides wide range of solutions to increase the efficiency and productivity of power sector like setting up distribution network, distribution load management and meter data management. But in Indian power sector, operation and distribution processes are manual, insufficient commercial focus, inadequate control, lack of transparency and reliable information this result high loss to power sector. Indian power sector is using stand-alone system for limited operational requirements or as a tool to solve specific problem without a long-term strategy. Most distribution utilities in India are still lacking in most basic requirements i.e. consumers and assets databases that result into direct revenue losses. Most utilities maintain manual records of consumers in the form of registers

especially, in rural areas that make the complete process time consuming. Using of electromechanical meters, manual reading of meters and bill preparation, inadequate bill collection facilities result in overall delay in revenue collection and that lead to losses in power sector companies. IT is widely acknowledged crucial for efficient operation and management of all industrial systems. This is true of the power utilities, which need to handle a large amount of information for their efficient operation.

Geographic Information System (GIS): GIS applications are many; power companies can collect and store a large amount of data that can be readily accessed and analyzed. Strength of GIS is integrating data and preparing it for analysis or modeling apart from tying together data from various sources makes it an important tool for the planning and decision making. User can display legend of all layers displayed on the map. This legend will be represented by the symbol of each layer with colour and the name of the layers in a list. System will display coordinate of the current mouse position and the coordinate value will change with the movement of mouse pointer over the map area. User can see co-ordinate only when the mouse pointer is inside the map area. GIS provides a wide range of solutions encompassing the entire business value chain in the power distribution sector from setting up distribution network and load management to customer information, assets management, billing and customer services. Digital system provides timely, accurate and easier way of acquiring information, which is very vital in taking prompt and accurate decisions.

Advanced applications: The advanced applications can be built only after establishing a strong foundation in the preceding phases. For instance, mobile field force solution can be built only after establishing a system for management of field service orders (and customer and service databases even earlier). E-business solutions such as customer self-service and e-procurement require the CIS, SCM (Supply Chain Management), etc., to be in place. Integrated Billing System For Large C and I Customers, Enterprise resource planning (ERP), Oracle ERP, SAP Utilities, SOA (Service-Oriented Architecture), AMR (Automated Meter Reading), Wireless Technologies-GSM / GPRS based and CDMA based technologies, Power Line Communication System (PLC).

Integrated metering, billing and collection systems: The objective is to integrate billing, payment and collection to eliminate scope for tampering and manipulation and thus, improve collection. Payments are currently made in person in most of the places. Only in few places payments can be made online or through ATM. IT can be used for making electronic payments including direct debit payments.

Energy accounting system to conduct energy audit: At present, meters are installed at 33 kV feeders and at some places on 11 kV feeders. Meters are not installed at distribution transformers (DT) level. Total energy input to a circle is known accurately but not the total energy sold, because of many customers are unmetered. As such energy losses at different stages are unknown. Energy accounting has started at some places but with inaccurate data. Due to lack of information, the control is ineffective and the responsibility cannot be fixed. It is necessary to know energy input and energy sold at various stages of sub-transmission and distribution to identify areas of high losses. Moreover, information on loading, voltage and consumption at different levels can be used for network management and reduction in outages. For this purpose, meters with real time communication, facility should be installed at 33 kV feeders, 11kV feeders and 11 kV /0.4 kV DTs. Non-metered customers are to be separated and supplied power

from different transformers. Map customers to respective DT's and build communication channels to transfer data from the meters to the central meter reading control system.

Remote reading is preferred over download facility through handheld device. It provides real time pictures while handheld device can give only snapshots. This information can be used for network management and in distribution automation.

Complaint handling: At present, consumers find very hard to lodge their complaints. The customers usually have to go to the substation for supply related complaints and the concerned offices for the bill related complaints. Power utilities can have call centers with IVR for outages and bill related complaints.

Distribution sector: In India, distribution business is characterized by manual and complicated processes. Inadequate controls, lack of commercial focus, limited transparency and lack of reliable information. As a result, the operations are highly inefficient with substantial revenue leakages and poor customer orientation. The use of IT has been low and in pockets. The several standalone applications have limited ability to effectively interface and integrate with other applications or with potential applications to be deployed in future. Although the level of deployment of IT varies significantly across the utilities, the key applications have been in multi-level aggregation of data or large scale data processing. Advance countries are using IT tools to gain in term of productivity, efficiency, reliability etc. It has been observed that Indian power companies are lagging behind due to not proper implementation of information technology. Other countries which have Aggregate Technical and Commercial losses in single digit figure their IT play central role in their business. A huge investment required to attain global standard which is not feasible at one go. Therefore, it is needed to adopt phase approach in IT implementation. IT is one of the pillars to achieve this future successfully. For quite a few years, utility in the developed countries have been leveraging the IT for obtaining significant benefits. The Indian sector too has introduced IT solutions but the approach has been piece meal with standalone applications deployed for a limited operational requirement. IT has been used only as a tool to address a specific issue or two at a time without holistic approach. It has led to limited integration of systems, underutilization of resources, absence of standard database, high cost of maintenance, inadequate interface and integration with other applications. These issues have adversely affected the return from IT investments. Incoherent technology strategy leads to situations where incompatible options are selected and large sums of money are wasted in attempt to integrate them .There is plenty of room for IT application within the power sector in India. There is a need to look at the global practices in IT adoption in the power sector so that India can benefit from them.

Q18	Some technologies have been mention in the study. Classify the technologies that which are OT and IT types	**15**	**CO4**
Q19	From the knowledge gained from the case study how will you like to implement smart grid for your hometown.	**15**	**CO4**