

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

### UNIT-I

1. a) Explain Biological Characteristics of Sewage in detail. **6M**  
b) Explain in detail about Carbon cycle of Decomposition with neat sketch. **6M**  
(OR)
2. a) Explain in detail about Catch basins and Flushing tanks with neat sketch. **6M**  
b) The one day and two day BOD of a sewage sample at 30°C are 110 and 150mg/l respectively. Calculate the 5 day BOD at 20°C. **6M**

### UNIT-II

3. a) What is meant by Skimming tank? Explain its role in Sewage treatment with neat sketch. **6M**  
b) Differentiate between standard and high rate Trickling filters. **6M**  
(OR)
4. a) Explain about Sewage treatment by Activated sludge process with neat sketch. **6M**  
b) Design a rectangular grit chamber from the following data. **6M**  
Flow of sewage =  $65 \times 10^6$  liters/day, Specific gravity of the grit = 2.70, Size of the grit particle to be removed = 0.21 mm, Viscosity of the water =  $1.0 \times 10^{-2}$  cm<sup>2</sup>/sec

### UNIT-III

5. a) What is meant by Soak pits? Explain their role in Sewage treatment. **6M**  
b) Explain in detail about Sewage disposal by Dilution. **6M**  
(OR)
6. a) Explain about high rate sludge digesters with neat diagram. **6M**  
b) Design a Septic Tank for 100 persons with average daily sewage flow of 200 lpcd. **6M**

### UNIT-IV

7. a) What are the various types of Air pollutants? Explain in detail. **6M**  
b) Explain in detail about various meteorological factors effecting Air pollution. **6M**  
(OR)
8. a) What are the various Air pollution control Equipments? Explain any one in detail. **6M**  
b) What are the various Impacts of Air pollution on Plants? Explain in detail. **6M**

### UNIT-V

9. a) What are the various sources of Noise pollution? Explain in detail. **6M**  
b) Define i) Frequency ii) Decibel scale iii) Sound Pressure Level **6M**  
(OR)
10. a) Explain impacts of Noise on Environment in detail. **6M**  
b) What are the various control methods of Noise pollution? Explain in detail. **6M**

# AR18

**CODE: 18EEE431**

**SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**IV B.Tech I Semester Supplementary Examinations, May-2022**

## **ELECTRIC DRIVES**

**(Electrical and Electronics Engineering)**

**Time: 3 Hours**

**Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

### **UNIT-I**

1. a) State and explain the important features of plugging braking method of dc motors. 6M
- b) Explain about regenerative braking 6M
- (OR)
2. Explain, with speed torque characteristics, four quadrant operation of dc separately excited motor fed from dual converter with non-simultaneous control. 12M

### **UNIT-II**

3. Explain the operation of single phase fully controlled rectifier control of dc separately excited motor with the help of drive circuit, motor terminal voltage, current waveforms, average voltage versus firing angle curve, quadrant diagram in V-I plane and speed torque characteristics for various firing angles. Assume continuous conduction. 12M
- (OR)
4. A 200 V, 875 rpm, 150 A separately excited dc motor has an armature resistance of  $0.06 \Omega$ . It is fed from a single phase fully-controlled rectifier with an ac source voltage of 220 V, 50 Hz. Assuming continuous conduction, calculate 12M
  - i. firing angle for rated motor torque and 750 rpm.
  - ii. firing angle for rated motor torque and  $(-500)$  rpm.
  - iii. motor speed for  $\alpha = 160^\circ$  and rated torque.

### **UNIT-III**

5. a) Describe the first quadrant chopper control of separately excited DC motor. 6M

- b) A 230 V, 960 rpm and 200 A separately excited dc motor has an armature resistance of  $0.02\Omega$ . The motor is fed from a chopper, which is capable of providing both motoring and braking operations. The source has a voltage of 230 V. When motor is operated in dynamic braking with braking resistance of 2 Ohms, calculate duty ratio of chopper for a motor speed of 600 rpm and braking torque of twice the rated value (assume continuous conduction) 6M

(OR)

6. Describe the four quadrant (motoring and regenerative braking in forward and reverse direction) chopper control of series excited dc motor with necessary diagrams and waveforms. 12M

#### UNIT-IV

7. a) Why stator voltage control is not suitable for speed control of induction motors in constant torque drives? 6M  
b) Explain VSI drives. 6M

(OR)

8. a) For variable frequency control of induction motor for speeds below base speed v/f ratio is maintained constant, why? 6M  
b) Why current source inverter fed induction motor drive is operated at a constant rated flux. 6M

#### UNIT-V

9. Explain in detail the operation of a static Scherbius drive with neat diagram. Mention its applications and limitations. 12M

(OR)

10. a) A three phase, 440 V, 50 Hz, 6 pole, 970 rpm, Y-connected wound-rotor induction motor has the following parameters referred to stator:  
 $R_s=0.2\text{ Ohm}$ ,  $R_r'=0.15\text{ Ohm}$ ,  $X_s=X_r'=0.4\text{ Ohm}$ . The stator to rotor turns ratio is 3.5. The motor speed is controlled by Static Scherbius Drive. The drive is designed for a speed range of 30% below the synchronous speed. Maximum value of firing angle is  $170^\circ$ . Calculate 8M  
i. Turns ratio of the transformer  
ii. Torque for a speed of 750 rpm and  $\alpha=140^\circ$   
b) Explain the true synchronous mode operation of a synchronous motor. 4M

FINITE ELEMENT METHODS  
(Mechanical Engineering)

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

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UNIT-I

1. a) The displacement field in micro units for a body is given by 8M  

$$u = (x^2 + y + z^2)i + (3 + x + z + y^2)j + (x^2 + 2y^2 + z^3)k$$
 Write down the expressions of strains, and find the values of six stresses at the point (1,2,0). Take  $E=200\text{GPa}$  and  $\nu=0.3$
  - b) Write down the equations of equilibrium for plane strain condition. 4M
- (OR)
2. a) A displacement field is imposed on a FE element as  $u = 1 + 3x + 4x^3 + 6xy^2$ ; 6M  
 $v = xy - 7x^2$ , Write down the expressions for  $\epsilon_{xx}$ ,  $\epsilon_{yy}$ , and  $\epsilon_{xy}$ , and find the values of three strain components at point (0,0).
  - b) Use Rayleigh Ritz method and find the midpoint displacement of the rod shown in figure below. 6M

UNIT-II

3. a) Calculate nodal displacements, strain and stress at each element, and reaction forces of the following bar shown in Fig. 1. 8M

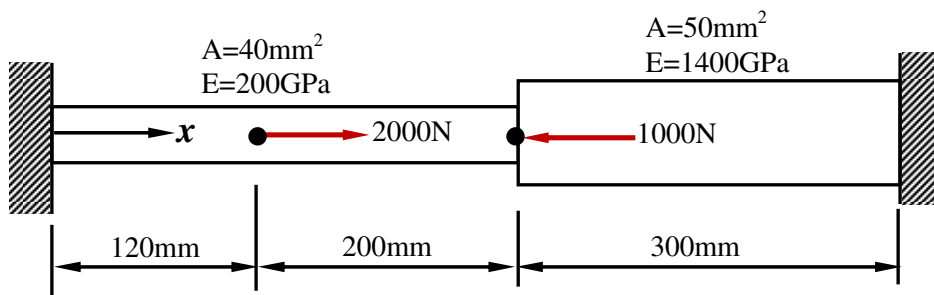


Fig. 1.

- b) From the above results on nodal displacements, calculate the displacement at  $x=50\text{mm}$ ,  $140\text{mm}$ ,  $380\text{mm}$ . 4M

(OR)

4. a) Derive the load vector for thermal loading of a two-noded bar element. 4M  
 b) Determine the nodal displacements, stresses and reaction forces at the supports of the bar shown in Fig 2. The temperature of 2<sup>nd</sup> element is increased by 50°C. 8M

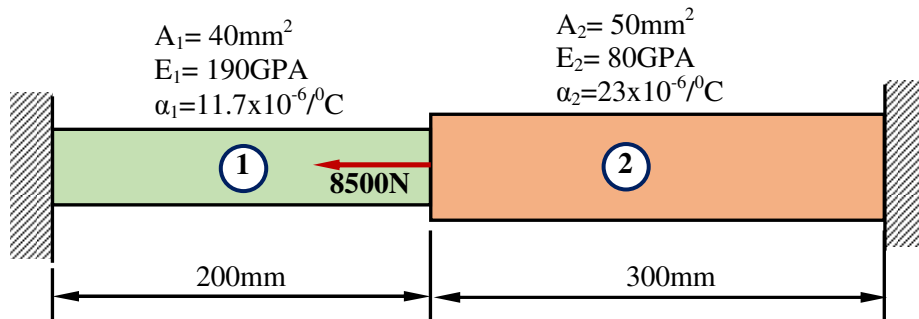


Fig. 2  
**UNIT-III**

5. a) For the pin jointed configuration shown in Fig.3. determine the stiffness values  $K_{11}$ ,  $K_{12}$ ,  $K_{22}$  of the global stiffness matrix. (CO3) 6M

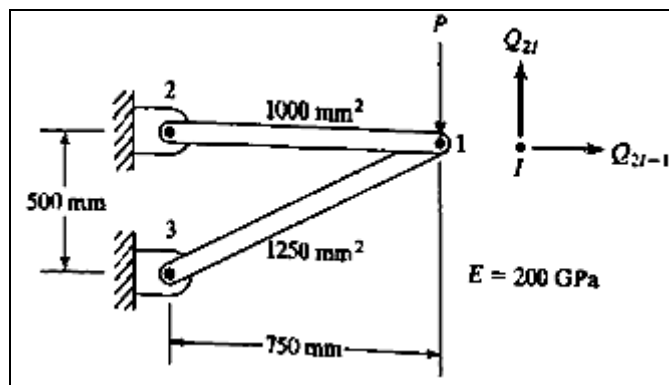


Fig.3.

- b) For the point located inside the triangular element in Fig.4., if  $p(x, y) = (2.8, 3.5)$  then evaluate 6M  
 (i) Shape functions  $N_1, N_2, N_3$  using area coordinates approach.  
 (ii) Area of the triangle

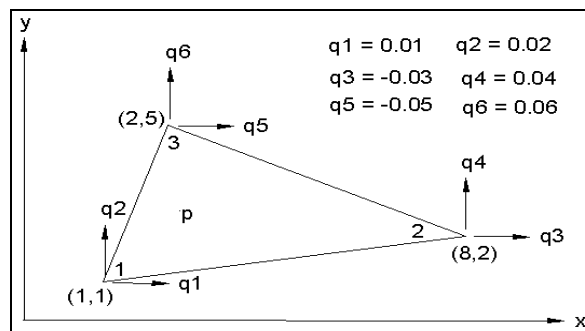
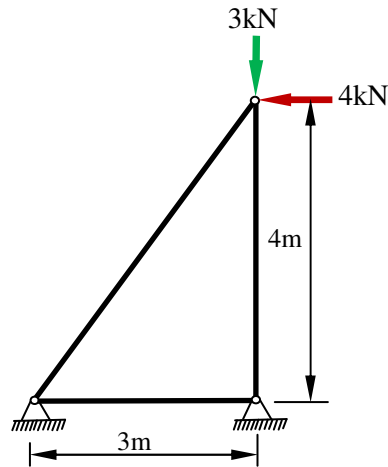


Fig.4.

6. a) Calculate the assembled stiffness matrix and load vector for truss shown in **Fig. 4**. 6M



**Fig. 4**

- b) Calculate the reaction forces at the support, deflection at each node and stresses at each element of the truss shown in **Fig 4**. Take axial rigidity  $AE = 100000N$  for all the elements. 6M

### **UNIT-IV**

7. a) Derive the stiffness matrix of 2-noded Euler-Bernoulli beam element. 6M
- b) Evaluate the following integrations using **Table 1**. 6M

$$i) \int_{-1}^1 (1 + 2\xi + \xi^3) d\xi \quad ii) \int_{-1}^1 \int_{-1}^1 (\xi + \eta + \xi\eta^2) d\xi d\eta$$

<b>Table 1:</b>		
<b>Order of Integration</b>	<b>Locations</b>	<b>Weight</b>
<b>1</b>	<b>0.0</b>	<b>2.0</b>
<b>2</b>	<b><math>\pm 0.057735</math></b>	<b>1.0</b>
<b>3</b>	<b>0</b>	<b>8/9</b>
	<b><math>\pm 0.77459</math></b>	<b>5/9</b>
<b>4</b>	<b><math>\pm 0.861136</math></b>	<b>0.347855</b>
	<b><math>\pm 0.339981</math></b>	<b>0.652145</b>

**(OR)**

8. a) Calculate the assembled stiffness matrix and load vector of the shown in Fig. 6M

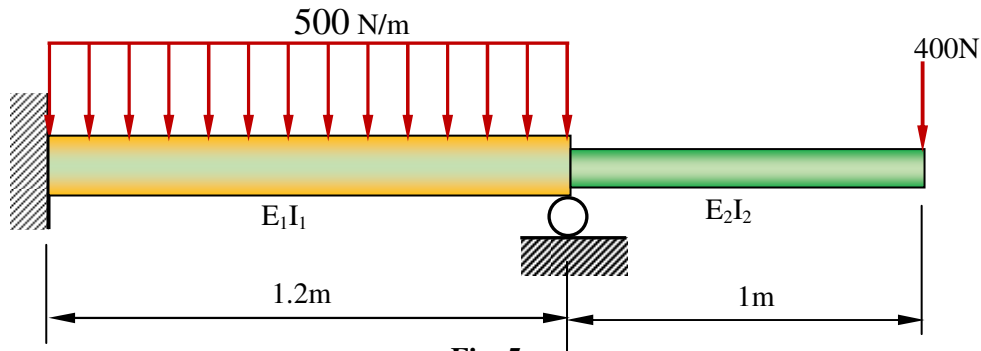


Fig. 5

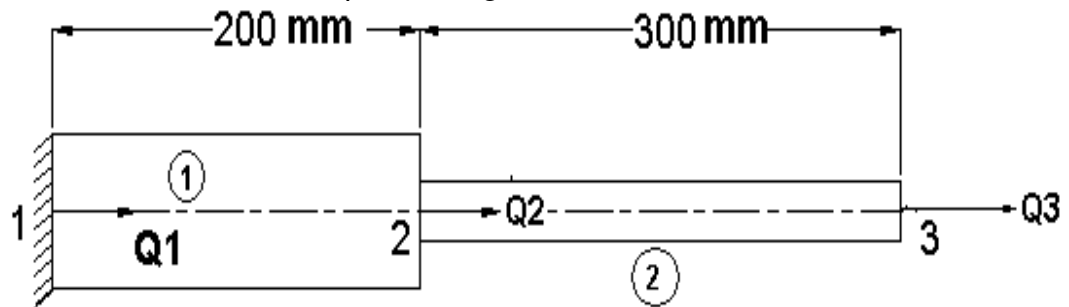
The flexural rigidity of two sections are given as:

$$E_1 I_1 = 12 \times 10^6 \text{ Nm}^2 \text{ and } E_2 I_2 = 8 \times 10^6 \text{ Nm}^2.$$

- b) Calculate the nodal deflections and slopes of the beam shown in Fig. . 6M

### UNIT-V

9. Determine the natural frequencies by solving the eigen value problem for the stepped bar shown in the figure below. Also find eigen vectors and draw the mode shapes.  $A_1 = 1200 \text{ mm}^2$ ,  $A_2 = 900 \text{ mm}^2$ .  $E = 200 \text{ GPa}$ ,  $\rho = 7850 \text{ kg/m}^3$  (CO5) 12M



(OR)

10. Derive the consistent mass matrix for 2-noded Euler-Bernouli beam element. 12M

**MICROWAVE ENGINEERING****(Electronics and Communication Engineering)****Time: 3 Hours****Max Marks: 60**

Answer ONE Question from each Unit

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**UNIT-I**

1. a) Derive the wave equation for a TM wave and obtain the field components in a rectangular wave guides? 8M
- b) A hollow rectangular waveguide has dimensions  $a=1.5$  cm, calculate the amount of attenuation if the frequency of the signal is 6GHz. 4M

**(OR)**

2. a) Derive the expression cut off frequency of a wave in a rectangular wave guides. 8M
- b) Explain the advantages of microwaves. 4M

**UNIT-II**

3. a) Explain about E-plane tee with suitable diagram and derive its  $S_{11}$  matrix? 6M
- b) Explain about H-plane tee with suitable diagram and derive its  $S_{11}$  matrix? 6M

**(OR)**

4. a) Find the Hybrid ring S-parameters and explain with neat sketch? 6M
- b) What are the ferrite devices? Discuss in detail about Isolator with neat diagram? 6M

**UNIT-III**

5. a) What is velocity modulation? Explain how velocity modulation is utilised in klystron amplifier? 6M
- b) A two cavity klystron is operated at 10GHz with  $V_0=1200$ V,  $I_0=30$ mA,  $D=1$ mm,  $L=4$ cm and  $R_{sh}=40$ k $\Omega$ . Neglecting beam loading, calculate (i) input RF voltage  $V_1$  for a maximum output voltage, (ii) voltage gain and (iii) efficiency. 6M

**(OR)**

6. a) Explain the operation of two cavity klystron with neat sketch. 6M
- b) Explain velocity modulation in reflex klystron with applegate diagram? 6M

**UNIT-IV**

7. a) What are slow wave structures? Explain how a helical TWT achieves amplification? 6M
- b) A helical TWT has diameter of 2mm with 50 turns per cm. 6M
  - i) Calculate axial phase velocity
  - ii) The anode voltage at which the twt can be operated for useful gain.

**(OR)**

8. a) Discuss in detail about helix travelling wave tube. 6M
- b) Explain the features of cylindrical magnetron. 6M

**UNIT-V**

9. a) Explain about domain formation in Gunn diode? Explain various oscillating modes of Gunn diode? 6M
- b) What are the avalanche transit time devices? Explain the working of TRAPATT diode? 6M

**(OR)**

10. a) Describe the procedure for measurement of Low VSWR and high VSWR using microwave bench? 6M
- b) Explain bolometer method for power measurement using microwave bench. 6M



# AR18

**CODE: 18CST417**

**SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**IV B.Tech I Semester Supplementary Examinations, May-2022**

**UML & DESIGN PATTERNS  
(Computer Science and Engineering)**

**Time: 3 Hours**

**Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

**UNIT-I**

1. a) Discuss about conceptual model of UML. 6M  
b) Explain software development life cycle. . 6M  
(OR)
2. a) What are two important components of use cases? 6M  
b) Why software architecture is so important in system design? Enlist and briefly explain different architectural styles. 6M

**UNIT-II**

3. a) Write the purpose of following terms with suitable examples and UML notations with respect to class model. (i) Association class (ii) Aggregation (iii) Multiplicity (iv) Constraint 6M  
b) Explain different stereo types that can applied for Generalization relationship 6M  
(OR)
4. a) Explain any four purposes of activity diagrams during system development process. 6M  
b) How we relate components and interfaces in a component diagram? Explain with an example 6M

**UNIT-III**

5. a) Draw the state chart diagram for railway management system 6M  
b) Explain in detail the relationships in UML for use case 6M  
(OR)
6. a) Explain how to model threads and processes. 6M  
b) Explain common uses of component diagrams. 6M

**UNIT-IV**

7. a) Write and explain the design principles of package design. 6M  
b) Write and explain about principle, structure, example, implementation, and design issues and advantages of smalltalk MVC design pattern. 6M  
(OR)
8. a) What are creational patterns? Explain any one creational pattern with example. 6M  
b) What are structural patterns? Explain any one creational pattern with example. 6M

**UNIT-V**

9. a) Explain about Adopter pattern in detail 6M  
b) Explain how singleton helps in communication. 6M  
(OR)
10. a) Brief about Chain of responsibility design pattern in detail 6M  
b) Brief about command design pattern in detail 6M

# AR16

**CODE: 16CE4026**

**SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**IV B.Tech I Semester supplementary Examinations, May-2022**

**ENVIRONMENTAL ENGINEERING-II**

**(Civil Engineering)**

**Time: 3 Hours**

**Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

## **UNIT-I**

1. Explain in detail the construction and maintenance of sewers with an emphasis on materials used, shapes, gradients adopted and testing? 14M
- (OR)**
2. Write a short note on BOD and deduce the expression for the first stage of BOD 14 M

## **UNIT-II**

3. Explain with a neat sketch on working and operational problems of Activated sludge process? Mention the advantages and disadvantages of the system? 14 M
- (OR)**
4. Explain with a neat sketch, working of (a) screens; (b) grit chamber and (c) skimming tank? 14 M

## **UNIT-III**

5. Write a detailed note on digestion of sewage sludge? With the aid of neat sketch explain the design and working of a digestion tank? 14 M
- (OR)**
6. With the aid of sketches, discuss the principle involved in design and construction of a soak pit? 14 M

## **UNIT-IV**

7. List out various particulate control technologies and explain the principle, working advantages and application of Electro static precipitator with a neat sketch? 14 M
- (OR)**
8. Define Meteorology and what are the primary meteorological factors that influence air pollution? Explain causes and effects of inversion of atmosphere. 14 M

## **UNIT-V**

9. Discuss in detail the various measurement methods of noise pollution and list out the noise pollution standards for residential, industrial and silent zones? 14 M
- (OR)**
10. Explain in detail the impacts of noise pollution on human beings and plants? Discuss the control measures to reduce the noise pollution in residential areas? 14 M

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

**UNIT-I**

1. a) List the various microwave frequency bands and write its applications? 4M
- b) Derive the wave equations for a TE wave and obtain all field components and parameters in a rectangular waveguide? 10M

**(OR)**

2. a) Define dominant and degenerate modes. Discuss in detail about the different modes TE, TM, TEM in wave propagation? 7M
- b) A rectangular waveguide is filled by dielectric material  $\epsilon_r=9$  and has inside dimensions of  $7 \times 3.5$  cm. It operates in dominant  $TE_{10}$  mode. 7M
- (i) Determine cut off frequency.
- (ii) Find the phase velocity in guide operating at a frequency of 2GHz.
- (iii) Find the guide wavelength at same frequency.

**UNIT-II**

3. a) Explain about Magic Tee junction, derive its S Matrix and list its applications? 10M
- b) A 90W power source is connected to input of a Direction coupler with Coupling factor=20dB Directivity=35dB and insertion loss is 0.5dB. Find the powers at remaining ports? 4M

**(OR)**

4. a) Illustrate in detail about E plane Tee and derive its S matrix? 7M
- b) Discuss in detail about the operation of four port circulator and find its S matrix? 7M

**UNIT-III**

5. a) Explain the construction and operation of two cavity klystron 7M
- b) List the differences between two cavity klystron and reflex klystron with respect to its working principle and characteristics? 7M

**(OR)**

6. a) A four-cavity klystron has beam voltage  $V_0=20$  kV, beam current  $I_0=2$  A, frequency=9GHz, DC Charge density= $10^{-6}$  C/m<sup>3</sup>, AC Charge density=  $10^{-8}$  C/m<sup>3</sup>, velocity of electron beam (v) is  $10^5$  m/s and Reduction factor=0.5. Calculate DC electron velocity, DC Phase constant, plasma frequency, reduced plasma frequency, DC and AC current densities? 7M
- b) Define velocity modulation and derive the equation of velocity modulation process of two-cavity Klystron? 7M

**UNIT-IV**

7. a) Define slow wave structure? Discuss the need for slow wave structures in microwave tubes? 7M
- b) Discuss in detail about the working principle of cylindrical magnetron? 7M

**(OR)**

8. a) Derive the expression for conventional current in TWT? 7M
- b) Elaborate the significance of Hartree Conditions? 7M

**UNIT-V**

9. a) Discuss in detail about the different modes of operation in a Gunn diode? 7M
- b) Illustrate in detail about the working principle and characteristics of TRAPATT diode? 7M

**(OR)**

10. a) Discuss in detail about various methods used to measure microwave power? 7M
- b) Explain in detail about frequency and attenuation measurement using necessary experimental setup? 7M