Hall Ticket No : **Question Paper Code :**

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)

III/IV B. Tech II- Semester Regular Examinations April – 2018

ADVANCED CONTROL SYSTEMS AND DESIGN (Elective-I)

(EEE)

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 in one place only

UNIT - I

1. a) Describe the operation of a two-phase A.C. Servomotor and obtain the transfer function from its characteristics. **(6M)**

   b) Explain the synchro and its operation. Explain how a synchro can be used as a position error detector **(6 M)**

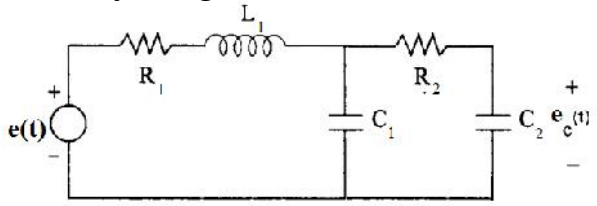
(OR)

2. a) Describe the construction, principle of operation of stepper motor and its use in control systems. **(6 M)**

   b) Explain the principle of operation Ward-Leonard system with a neat circuit diagram. State its characteristics and applications **(6 M)**

UNIT - II

3. a) For the system given below, obtain the state variable model. **(6 M)**



   b) Obtain the state transition matrix using matrix exponential method **(6 M)**
   $\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} U$.
   Where *'u'* is a unit step input and also compute the solution of the state equation $X_0 = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$

(OR)

4. a) Consider a system having state model **(6 M)**
   $\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \end{bmatrix} = \begin{bmatrix} -2 & -3 \\ 4 & 2 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} 3 \\ 5 \end{bmatrix} U$ and $Y(t) = \begin{bmatrix} 1 & 1 \end{bmatrix} \begin{bmatrix} X_1(t) \\ X_2(t) \end{bmatrix}$ with D=0
   Obtain its transfer function.

   b) Given that $A_1 = \begin{bmatrix} \pm & 0 \\ 0 & \pm \end{bmatrix}$; $A_2 = \begin{bmatrix} 0 & \mu \\ -\mu & 0 \end{bmatrix}$ and $A = \begin{bmatrix} \pm & \mu \\ -\mu & \pm \end{bmatrix}$ **(4 M)**
   Compute the state transition matrix e^{At}.

Contd….2

UNIT – III

5. a) Comment on controllability and observability of the following state model **(6 M)**

$$\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\end{bmatrix}=\begin{bmatrix}-1 & 0\\ 0 & -2\end{bmatrix}\begin{bmatrix}X_1\\ X_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}U \text{ and } Y(t)=\begin{bmatrix}1 & 2\end{bmatrix}\begin{bmatrix}X_1(t)\\ X_2(t)\end{bmatrix}$$

b) A single input system described by the state equation **(6 M)**

$$\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}\begin{bmatrix}X_1\\ X_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}U$$

Design a state variable feedback controller such that the closed loop poles to locate at -2 and -3

(**OR**)

6. a) Comment on controllability and observability of the following state model **(6 M)**

$$\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\end{bmatrix}=\begin{bmatrix}-0.2 & 0.4\\ 0.1 & -0.1\end{bmatrix}\begin{bmatrix}X_1\\ X_2\end{bmatrix}+\begin{bmatrix}1\\ 1\end{bmatrix}U \text{ and } Y(t)=\begin{bmatrix}1 & 0\end{bmatrix}\begin{bmatrix}X_1(t)\\ X_2(t)\end{bmatrix}$$

b) Find out the state feedback gain matrix K for the following system by converting the system into controllable canonical form such that the closed loop poles are located at -0.5 and -0.6. **(6 M)**

$$\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\end{bmatrix}=\begin{bmatrix}-1 & -1\\ 0 & 2\end{bmatrix}\begin{bmatrix}X_1\\ X_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}U$$

UNIT – IV

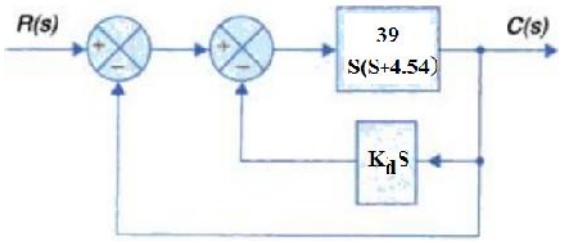
7. a) Explain effects of Proportional + Integral controller on standard second order system. **(6 M)**

b) Design and physically realize a network for open loop transfer function of a unity feedback system is with negative unity feedback in the linear system simulator. By what factor should the amplifier gain k be reduced, so that the peak overshoot of unit step response of the system is reduced from 75% to 25%. **(6 M)**

(**OR**)

8. a) Explain effects of Proportional + Derivative controller on standard second order system. **(6 M)**

b) For a given block diagram **(6 M)**



Contd….3

i. Find out ξ and w_n when $k_d=0$
ii. (ii) how can you improve the damping factor from its present value (when $k_d=0$) to $\xi=0.7$.

UNIT – V

9. a) Explain the procedural steps to design a lead compensator using root locus **(4 M)**

b) Using Bode plot method design a suitable lag compensating network for **(8 M)**

$G(S)=\frac{K}{S(S+4)}$.

So that the compensated network will have $e_{ss} \le 0.04$, phase margin $\ge 45^0$

(**OR**)

10. a) Explain the procedural steps to design a lag compensator using Bode plot **(4 M)**

b) Using Root locus method design a suitable lead compensating network for a system with unity feedback and having open loop transfer function **(8 M)**

$G(S)=\frac{K}{S(S+4)(S+4)}$.So that the compensated network will have

i. Damping ratio $\xi = 0.5$
ii. Undamped natural frequency $\omega_n = 2$ rad/sec

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Hall Ticket No : **Question Paper Code :**

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)

III/IV B. Tech II- Semester Regular Examinations April – 2018

COMPUTER ARCHITECTURE & ORGANIZATION

(EEE)

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 in one place only

UNIT-1

1) **a)** What is register and register transfer? [2M]
b) Draw block diagram and timing diagram for register transfer with using control function [4M]
c) Construct a common bus system for memory transfer with using four registers [6M]

(OR)

2) **a)** Draw a 4-bit arithmetic circuit and explain it with functional table. [6M]
b) How arithmetic logic shift unit is advantages over individual units? Explain it with appropriate diagram [6M]

UNIT-II

3) **a)** How instruction codes useful in computer organization? What is indirect addressing [4M]
b) Draw and explain 16 bit common bus system for transfer information between register and memory [8M]

(OR)

4) **a)** Why instruction cycle for execution of instructions? Explain each phase of instruction cycle. [6M]
b) what is effective address ? Explain all memory reference instructions [6M]

UNIT-III

5) **a)** What is the difference between a microprocessor and a micro program? Is it possible to design a microprocessor without a micro program? Are all micro programmed computers also microprocessors? [6M]
b) How micro instruction format useful for control memory? Explain Micro instruction with any computer instructions. [6M]

(OR)

6) **a)** How stack organization helpful in computer organization? Discuss stack operation with examples [6M]
b) Why addressing modes for CPU? Explain various addressing modes supported by general purpose CPU [6M]

UNIT-IV

7) **a)** How input-output interface providing transferring information between internal storage and external storage? Discuss the methodologies. [6M]
b) What is the Asynchronous data transfer? Justify how handshaking method advantages among two independent units. [6M]

(OR)

8) **a)** What is interrupt and what is polling? Discuss Diasy-chain priority interrupt. [6M]
b) How Direct Memory Access(DMA) helps faster transfer of data among devices. Discus working procedure of DMA controller [6M]

UNIT –V

9) **a)** Discuss the following terms briefly
i) Multiprogramming ii) Catch memory iii) Auxiliary memory [6M]
b) Differentiate between Auxiliary memory and associate memory [6M]

(OR)

10) **a)** Which is the fastest memory? Discuss working procedure of the Cache memory [6M]
b) How address mapping used in the virtual memory? Discuss page replacement in the virtual memory. [6M]

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Hall Ticket No : **Question Paper Code :**

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)

III/IV B. Tech II- Semester Regular Examinations April – 2018

Non-Conventional Energy Sources & Applications (Elective-I)
(EEE)

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 in one place only

UNIT-I

1. a) What are the prospectus of non-conventional energy sources in India? Explain (**4M**)

   b) Describe briefly the types of solar power plant. What are the advantages and disadvantages? (**8M**)

(OR)

2. a) Discuss the merits and demerits of non-conventional energy sources over conventional energy sources. (**6M**)
   b) Calculate the number of daylight hours at Delhi on December 21st and June 21st in a leap year for the following data is $\phi=28^{0}35'$ (**6M**)

UNIT-II

3. a) Derive the expression for power developed due to wind. (**4M**)
   b) Describe with neat sketch, the working of a wind energy conversion system (WECS) with main components. (**8M**)

(OR)

4. a) How are the wind energy system classified? Discuss briefly. (**4M**)
   b) What are the major sources and location for generation of power from wind energy? Explain the important parameters to be considered for the site selection. (**8M**)

UNIT-III

5. a) Explain the principle of tidal power generation. (**4M**)
   b) What are the main types of ocean thermal energy conversion OTEC power plants? Describe the working with neat sketch. (**8M**)

(OR)

6. a) Give the basic principle of ocean thermal energy conversion system (OTEC). (**6M**)
   b) Write short notes on wave energy conversion machines with diagram. (**6M**)

UNIT-IV

7. a) What are the factors, which affect the size of the bio-gas plants? (**4M**)
   b) What is meant by anaerobic digestion? What are the factors, which affect bio digestion? Explain briefly. (**8M**)

(OR)

8. a) What is meant by anaerobic digestion? What are the main applications of bio-gas? (**4M**)
   b) Explain the constructional details and working of KVIC digester. (**8M**)

UNIT-V

9. a) What is the working principle MHD generator? (**4M**)
   b) Explain the working of open cycle MHD power plant with neat diagram. (**8M**)

(OR)

10. a) What is the working principle of fuel cell. (**4M**)
    b) Explain the combined operation of MHD generation with diesel power plant. (**8M**)

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Question Paper Code :

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)

III/IV B. Tech II- Semester Regular Examinations April – 2018

PERFORMANCE OF INDUCTION AND SYNCHRONOUS MACHINES
(EEE)

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 in one place only

UNIT – I

1. a) Explain the concept of rotating magnetic field in Three phase induction motor. (**6M**)

   b) A 500 V, 3 -Phase, 50 Hz induction motor develops an output of 15 KW at 950 r.p.m. If the input p.f. is 0.86 lagging, Mechanical losses are 730 W and stator losses 1500W, Find (**6M**)
   i) the slip
   ii) the rotor Cu loss
   iii) the motor input
   iv) the line current

(OR)

2. a) Draw the speed-torque characteristics of 3-phase Induction motor and point out the three salient operating points on it. (**6M**)

   b) A 15KW, 400V, 4 pole, 50Hz 3-phase star connected Induction motor gave the following test results (**6M**)

No-load test	400V, 9A, 1310 W (line values)
Blocked Rotor test	200V, 50A, 7100 W (line values)

Stator and rotor ohmic losses at stand still are equal.
Draw the circle diagram and find the parameters: Full load current, torque and slip.

UNIT – II

3. a) Explain the principle of operation of Single phase induction motor with the concept double field revolving theory. (**6M**)

   b) Find the mechanical power output at a slip of 0.05 of the 185W,4Pole 110 V,60HZ single phase induction motor has following constants: Resistance of stator main winding=1.86 ohms, Reactance of stator main winding=2.56 ohms ,Magnetizing reactance of stator main winding=53.5 ohms, Rotor resistance at standstill=3.56 ohms, Rotor reactance at standstill=2.56 ohms. (**6M**)

(OR)

4. a) Explain about the construction and principle of repulsion type motor (**6M**)

   b) Explain the operation of capacitor start and capacitor run induction motor with neat diagrams. (**6M**)

UNIT – III

5. a) Explain the MMF method to predict the voltage regulation of a 3-phase alternator. (CO1) (**6M**)

   b) A 10 KVA,440V,50Hz,3-Phase alternator has the open circuit characteristics given below (**6M**)

Field current	1.5	3.0	5.0	8.0	11.0	15.0
Terminal voltage	150	300	440	550	600	635

   With Full load zero power factor applied an excitation of 14A produced a terminal voltage of 500V on short circuit, 4A excitation was required to give full load current. Determine Percentage regulation for full load 0.8 pf lagging.(as accurate as possible.)

(OR)

6. a) Give the constructional details of an Non salient pole synchronous machine. (**6M**)

   b) Find the synchronous impedance and reactance of a 3-phase alternator in which a field current of 5A produces an armature current of 250 A on short circuit and a generated emf of 1500V on open circuit. The armature resistance per phase is 1ohm.The machine is star connected. (**6M**)

UNIT – IV

7. a) With a circuit diagram ,explain the test to be conducted for determining $X_d$and$X_q$of a Salient pole alternator. Explain the reason why the slip be kept as small as possible during the test. (**6M**)

   b) Calculate the value of synchronizing power in KW for one mechanical degree of displacement at 0.8pf lagging for a 3-phase,2000KVA,6600V,50Hz 12pole machine having Xs of 25%and negligible resistance (**6M**)

(OR)

8. a) Develop the vector diagram based on Blondel's two reaction theory (**4M**)

   b) List out the conditions necessary for the Parallel operation of Synchronous generators. (**3M**)

   c) Two similar alternators running in parallel have an emf induced of 1200V per phase.The synchronous impedance per phase of two alternator are (0.1 + j2.5) ohms per phase and (0.3 +j4)ohms per phase. The two alternator supply a load impedance (**5M**)

of (6+j8) ohms per phase.Find the terminal voltage of the machine.

UNIT – V

9. a) Describe in detail,the effect of varying excitation upon the armature current and power factor of a synchronous motor when the input power is constant. (**6M**)

   b) A 3-phase, 100-h.p., 440-V, star-connected synchronousmotor has a synchronous impedance per phase of 0.1 + j1Ω.The excitation and torque losses are 4 kW and may beassumed constant. Calculate the line current, power factor and efficiency when operating at full load with an excitation equivalent to 400 line volts. (**6M**)

(OR)

10. a) Explain the concept of Hunting in Synchronous motor. (**6M**)

    b) Explain about the various methods of starting a Three phase synchronous motor. (**6M**)

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Question Paper Code :

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)

III/IV B. Tech II- Semester Regular Examinations April – 2018

POWER ELECTRONICS

(EEE)

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 in one place only

UNIT – I

1.	a)	Explain in detail turn on methods of SCR	(**6M**)
	b)	If the latching current for an SCR inserted in between a dc voltage source of 200v and load is 100ma. Compute the minimum width of gate pulse required to turn on this SCR in case the load consists of R=20Ω in series with L=2H.	(**6M**)

(**OR**)

2.	a)	With the help of two transistor analogy 0f SCR	(**6M**)
	b)	Explain in detail the static VI characteristics of SCR	(**6M**)

UNIT – II

3.	a)	Explain the operation of UJT and draw its static characteristics. Also, explain how UJT can be used as a relaxation oscillator.	(**6M**)
	b)	Explain the class B commutation of SCR in detail	(**6M**)

(**OR**)

4.	a)	Define the term String Efficiency and Percentage Derating Factor. Discuss the principle of operation of SCRs in parallel. What are the problems encountered during parallel operation of SCRs?	(**6M**)
	b)	A thyristor string is made up of a number of SCRs connected in series and parallel. The string has voltage and current ratings of 11KV and 4KA respectively. The voltage and current ratings of available SCRs are 1800V &1000A respectively. For a string efficiency of 90%. Calculate number of series & parallel connected SCRs. Also derive formula used for static equalizing resistance for the string	(**6M**)

UNIT – III

5.	a)	Explain the working of 1-phase full wave bridge controlled rectifier with neat waveforms(RL load)	(**6M**)
	b)	Explain the effect of source impedance on the performance of single phase rectifier circuits	(**6M**)

(**OR**)

6. a) Explain the working of 3-phase full wave bridge controlled rectifier with neat waveforms(R load) (**6M**)
   b) Find the average output voltage of 1-phase full wave bridge controlled rectifier connected to RL load and fed by source voltage of 230V. (R=0.4 ohms & L=2mH). Also determine average load current. (**6M**)

UNIT – IV

7. a) Explain the operation of Single phase VSI. Draw the load current, voltage and capacitor voltage waveforms. (**8M**)
   b) Calculate the output frequency of a series inverter circuit with L= 20MH, C=0.25µF, R=600Ω, off time=0.2 ms and source voltage is 220 volts. (**4M**)

(**OR**)

8. a) Explain the operation of mc murray Bedford inverter in detail (**12M**)

UNIT – V

9. a) Explain the operation of JONE'S CHOPPER**.** (**8M**)
   b) Step up chopper has input voltage of 220 volts and output voltage of 660 volts. If the conducting time of SCR is 100µs. compute the pulse width of output voltage. In case output voltage width is halved for constant frequency operation, find the average value of new output voltage. (**4M**)

(**OR**)

10. a) Explain the operation of single phase bridge type Step-down Cyclo converter with RL load for continues conduction (**6M)**
    b) Explain different operating modes of TRIAC with the help of diagrams and also draw its V-I characteristics. (**6M**)

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Question Paper Code :

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)
III/IV B. Tech II- Semester Regular Examinations April – 2018
POWER TRANSMISSION & DISTRIBUTION
(EEE)

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 in one place only

UNIT – I

1. a) State and prove Kelvin's law for economic size of conductors for transmission. **(6M)**

   b) Compare the conductor weights for (i) 3-ϕ 4-wire (ii) DC 2-wire systems for the same lamp voltages and same losses in both cases. Assume balanced loads and the neutral wire to be half the cross-section of the outer conductors. **(6M)**

(OR)

2. a) Explain ring main and radial distribution systems. **(6M)**

   b) An industrial load is supplied by a 3-ϕ cable from a substation at a distance of 6 Km. The voltage at the load is 11 KV. The daily load cycle for 6 days in a week for the entire year is given as
   700 KW at 0.8 power factor lagging for 7hrs; 400 KW at 0.9 power factor lagging for 3hrs; 88 KW at unity power factorfor 14hrs.
   Compute the most economical cross-section of conductors for the cable whose cost is Rs (5000 a + 1500) per Km, where a is in cm^2. The tariff for the energy consumed in the form of losses is 5 paise per unit. Assume the rate of interest and depreciation as 15%. The resistance per Km of conductor is (0.173/a) ohms. **(6M)**

UNIT – II

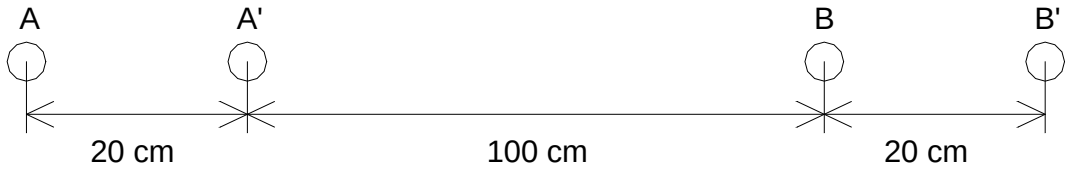
3. a) Derive an expression for the inductance per phase of a 3-ϕdouble circuit transmission line when conductors are in hexagonal spacing. **(6M)**

   b) A 220 KV, 50 Hz, 200 Km long 3-ϕ line has its conductors on the corners of a triangle with sides 6M, 6M and 12m. The conductor radius is 1.81cm. Find the charging current and total charging MVAR. **(6M)**

(**OR**)

4. a) Derive an expression for the capacitance to neutral per phase of a 3-ϕ symmetrically spaced overhead transmission line. **(6M)**

   b) In a single-phase line, conductors A and A′ form one circuit while conductors B and B′ in parallel form the return path. Calculate the total inductance of the line per Km assuming that the current is equally shared by the two parallel conductors. Conductor diameter is 2 cm. **(6M)**



UNIT – III

5. a) Derive the generalized network constants of a medium transmission line and draw the phasor diagram assuming nominal-Π configuration. **(6M)**

   b) A 3-ϕ, 50Hz short transmission line delivers a load of 2400 KW at a power factor of 0.8 lagging and at 11KV over a distance of 20Km. The line conductors are placed at the corners of an equilateral triangle of 2m side. The line losses are 10% of the power delivered. Calculate the sending end power factor. Specific resistance of the conductor material is 1.73 μΩ-cm. **(6M)**

(**OR**)

6. a) Explain the following. **(6M)**
   (a) Surge impedance loading (b) Ferranti effect

   b) Find the efficiency and regulation of a 3-ϕ, **100**Km, **50**Hz transmission line delivering **50** MW at a power factor of **0.8** lagging and **132** KV to a balanced load. Each conductor is having a resistance of **0.1** ohm/Km, reactance of **0.3** ohm/Km and admittance of $\mathbf{3x10^{-6}}$ Mho/Km. Neglect the leakage. Use nominal-T configuration. **(6M)**

UNIT – IV

7. a) Explain string efficiency and the methods used to improve it. **(6M)**

   b) Calculate the maximum sag and vertical sag of a line with copper conductors whose specifications are 0.484 cm^2, 7/0.295cm. The weight of the conductor is 428 kg/km and breaking strength 1973 kg. Assume factor of safety 2, span 200m and level supports. The line is subjected to wind pressure of 38 kg/m^2 of the projected area. The radial thickness of ice is 1.2 cm. One cubic metre of ice weighs 913.5 kg. **(6M)**

(OR)

8. a) Derive an expression for sag in an overhead transmission line having supports at the same level. **(6M)**

   b) An insulator string has four units each having a safe working voltage of 15 KV. The ratio of mutual capacitance to shunt capacitance is 10 : 1. Calculate the maximum safe working voltage of the string and the string efficiency. **(6M)**

UNIT – V

9. a) What do you mean by grading of cables? Explain the method of capacitancegrading. **(6M)**

   b) A 3-ϕ, 220KV, 50Hz transmission line consists of 1.5 cm radius conductorspaced 2m apart in equilateral triangular formation. If the temperature is 400^0Cand atmospheric pressure is 76 cm of Hg, calculate the corona loss per kmof the line. Take $m_0 = 0.85$. **(6M)**

(OR)

10. a) Explain the phenomenon of corona. Derive the expression for visual critical voltage. **(6M)**

    b) A single core lead sheathed cable has a conductor diameter of 3 cm. The diameter of the cable being 9 cm. The cable is graded by using two dielectrics of relative permittivity 5 and 4 respectively with corresponding safe working stresses of 30 kv/cm and 20 kv/cm. Calculate the radial thickness of each insulating layer and the safe working voltage of the cable. **(6M)**

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Hall Ticket No: **Question Paper Code :**

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)
III/IV B. Tech II- Semester Regular Examinations April - 2018
THERMODYNAMICS AND MECHANICS OF FLUIDS
(Mechanical)

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 in one place only

UNIT-1

1. a) Explain the laws of Thermo dynamics. (4M)

   b) Derive the relation between gas constant and specific heat at constant volume and constant pressure . (8M)

(**OR)**

2. a) Define a thermodynamic system, differentiate between open system, closed system and an isolated system . (4M)

   b) i) Explain the any three non flow thermodynamic processes and derive the work done. (4M)

   ii) A stationary mass of gas is compressed without friction from an initial state of 0.3 m^3 and 0.105 mpa to a final state of 0.15 m^3 and 0.105 mpa, The pressure remaining constant during the processes. There is a transfer of 37.6 kJ of heat from the gas during the processes. How much does the internal energy of the gas change. (4M)

UNIT-2

3. a) Explain the classification of IC engines. (4M)

   b) Derive the expression of work done and efficiency of diesel cycle . (8M)

(**OR)**

4. a) Explain the Differences between 4 stroke and 2 stroke engine. (6M)

   b) Explain the working principle of 2 stroke petrol engine . (6M)

UNIT-3

5. a) State and prove the Hydrostatic law . (4M)

   b) Explain briefly about Vapour pressure and Cavitation. . (4M)

   c) A plate 0.025mm distance from a fixed plate, moves at 60cm/sec and requires a force of 2 N per unit area i.e. 2 N/m^2 to maintain n this speed. Determine the fluid viscosity between the plates . (4M)

(**OR)**

6. a) State and prove the Pascal's law. (4M)

b) The right limb of a simple U-tube Manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of specific gravity 0.9 is flowing. The center of the pipe is 12cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of the mercury level in the two limbs is 20cm. (8M)

UNIT-4

7. a) Explain the different types of fluid flows and define stream line, path line. (6M)

b). If for a two dimensional potential flow, the velocity potential is given by $\varphi = x(2y-1)$). Determine the velocity at the point P(4,5).Determine also the value of stream function at the point P. (6M)

OR

8. a) State Bernoulli's theorem for a steady flow of an in compressible fluid and derive an expression for the Bernoulli's theorem . (6M)

b) A 45^0 reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 600mm and 300mm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet to bend is $8.829N/cm^2$ and rate of flow of water is 600liters/sec. (6M)

UNIT-5

9. a)Derive the Force exerted by the jet on a stationary vertical plate. (4M)

b) A pelton wheel has a mean bucket speed of 10m/sec with a jet of water flowing at a rate of 700liters/sec under a head of 30m. The buckets deflects the jet through an angle of 160^0.Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume coefficient of velocity as 0.98. (8M)

OR

10. a) Explain the working principle of Francis turbine . (6M)

b)A jet of water of diameter 50mm moving with a velocity of 25m/sec impinges on a fixed curved plate tangentially at one end at an angle of 30^0 to the horizontal. Calculate the resultant force of the jet on the plate if the jet is deflected through an angle of 50^0. (6M)