Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EE301

Course Name: POWER GENERATION, TRANSMISSION AND PROTECTION

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries5 marks. Marks

1		With the help of a block diagram explain wind power generation	(5)
2		What is transposition of lines? Comment on its necessity in the system.	(5)
3		Comment on the effect of wind and ice loading on transmission line with respect to change in sag calculation.	(5)
4		List the advantages and disadvantages of HVDC transmission.	(5)
5		Clarify the term duality in terms of amplitude and phase comparators.	(5)
6		Discuss the problems associated with capacitive current chopping.	(5)
7		State the main types of distribution systems and compare their applications.	(5)
8		What is meant by earth fault protection of an alternator? How is it implemented?	(5)

PART B

Answer any two full questions, each carries 10 marks.

9	a)	A proposed station has the following load cycle: Time in hours: 6-8 8-11 11-16 16-19 19-22 22-24 24-6 Load in MW: 20 40 50 35 70 40 20 Draw the load curve and select suitable generator units from 10,000, 20,000, 25,000, 30,000 kVA. Prepare the operation schedule for the selected machines and determine the load factor from the curve.	(5)
	b)	State Skin Effect and Ferranti Effect and elucidate them with necessary diagrams	(5)
10	a)	Enlighten upon the various components and their operation in a hydroelectric power plant for energy production.	(5)
	b)	Derive the expression for capacitance in a single phase overhead line under the influence of earth effect.	(5)
11	a)	Mention the merits and demerits of solar power generation in bulk and explain with respect to live examples.	(5)
	b)	Classify transmission lines according to their length and enlist the line models. Derive the ABCD constants for medium lines using nominal π method.	(5)

PART C

Answer any two full questions, each carries 10 marks.

12 a) Illustrate the methods used for improving string efficiency of overhead line insulators. (5)

b) Derive the expressions for capacitance and insulation resistance of a single core cable. (5)

13 a) Explain the advantages and disadvantages of corona. (5)

b) With the aid of single line diagrams, differentiate between mono polar and bipolar types of HVDC links. Comment on their use in the system. (5)

14 a) Discuss the various conductor materials used for overhead lines. What are their relative merits and demerits? (5)

b) Draw the configuration of FC+TCR. Explain its operation. (5)

PART D

Answer any two full questions, each carries 10 marks.

15 a) Derive the expression for Rate of Rise of Restriking Voltage. (5)

b) What factors cause difficulty in applying circulating current principle to a power transformer? (5)

16 a) With a neat diagram, explain the arc extinction in VCB. (5)

b) Explain the working of a surge diverter. (5)

17 a) Explain the operation of a microprocessor based over-current relay with the aid of a block diagram. (5)

b) A single phase distributor AB has a total impedance of $(0.1 + j0.2)\Omega$. At the far end B, a current of 80A at 0.8 p.f. lagging and at mid-point C a current of 100A at 0.6 p.f. lagging are tapped. If the voltage of the far end is maintained at 200V, determine: (i) Supply end voltage V_A and (ii) Phase angle between V_A and V_B. The load power factors are with respect to the voltage at the far end. (5)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: EE301

Course Name: POWER GENERATION, TRANSMISSION AND PROTECTION

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries5 marks. Marks

1		What are the limiting factors in tapping the wind and solar potential?	(5)
2		Explain the principle and causes of proximity effect and Ferranti effect using appropriate figures	(5)
3		What are the critical voltages in the formation of Corona? What is the effect of Corona?	(5)
4		With a neat cross sectional view show the constructional features of an EHT Cable.	(5)
5		What are the essential qualities required by any insulating medium used for arc quenching? What are the usual insulating media used?	(5)
6		Explain the significant features of a Microprocessor based relay.	(5)
7		What makes the differential protection very significant in the protection schemes of electrical machines and transformers?	(5)
8		Calculate the voltage drop and Power loss for a radial load of 120A, 0.8 pf lag supplied by a 6.6kV Three Phase system with a branch impedance of 2 +j2 ohms.	(5)

PART B

Answer any two full questions, each carries10 marks.

9	a)	With a neat sketch explain the principle of working of a High Head Hydro-electric Power Station.	(5)
	b)	An 80 km long transmission line has a series impedance of (0.15+j0.75) ohm per km and a shunt admittance of j5.1 x 10^{-6} ohm per km. Find the A, B, C, D parameters by Nominal Pi method.	(5)
10	a)	Derive the inductance of a single phase transmission line with three conductors arranged vertically in Side A and two conductors in Side B. The distance between adjacent conductors in each Side is 6m and that between the	(5)

sides are 8m. Each conductor is of radius 0.3cm.

b) A generating station has the following maximum loads: 16000kW, 12000kW, 10000kW, 7000kW and 800kW. The annual load factor is 50%. Calculate the diversity factor and annual energy consumption if the maximum demand on the station is noted as 24000kW. (5)

11 a) A 3-phase 500-HP 50Hz, 11kV star connected induction motor has a full load efficiency of 85% and a lagging p.f. of 0.8. It is connected to a feeder and it is desired to correct the p.f. to 0.95 lagging. Determine : (5)

(i) The Capacitor bank rating in kVAR and

(ii) The capacitance of each unit if the units are connected in Star.

b) Derive the Capacitance of a single phase overhead transmission line considering the effect of earth. (5)

PART C

Answer any two full questions, each carries10 marks.

12 a) Following results are obtained by making experiments on three phase, three core metal sheathed cable: (5)

(a) Capacitance between all the three bunched conductors and sheath is 1.2 micro Farad.

(b) Capacitance between any one conductor and sheath and the other two being insulated is 0.8 micro Farad.

Calculate the capacitance (C) between any two conductors when the third conductor is connected to the sheath.

b) A transmission line conductor at a river crossing is supported from two towers at a height of 45m and 75m above the water level. The span length is 300m. Weight of the conductor is 0.85kg/m. Determine the clearance between the conductor and water at a point midway between towers if the tension in the conductor is 2050kg. (5)

13 a) What is the expansion of FACTS? What are the devices used as FACTS devices? Why are they significant in the present scenario? (5)

b) A three phase overhead transmission line is supported by three disc suspension insulators. The potentials across the first and second insulator are 9kV and 12kV respectively. Find out: (5)

(i) The line voltage and

(ii) The string efficiency

14 a) What are the advantages and disadvantages of HVDC transmission systems? (4)

b) Derive Kelvin's law for conductors (4)

c) What are the advantages of bundling of conductors? (2)

PART D

Answer any two full questions, each carries 10 marks.

15 a) In a short circuit test on a 132kV three phase system, the breaker gave the following result: power factor of the fault =0.6, recovery voltage 0.97of full line value; the breaking current is symmetrical and the restriking transient had a natural frequency of 16kHz. Determine the rate of rise of restriking voltage. Assume that the fault is grounded. (6)

b) Derive the equations for voltage drop and current loss in a two wire ring main distributor supplied by (i) DC and (ii) AC Voltages. (4)

16 a) With a neat sketch explain the principle of operation of an Air Blast Circuit Breaker (5)

b) What are the primary causes of over voltages? How are the equipments protected from over voltages? (5)

17 a) Explain the principle of operation of a static over current relay. (5)

b) What are the three main protection aspects included in the protection of alternators? Why are they significant? (5)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: EE301

Course Name: POWER GENERATION, TRANSMISSION AND PROTECTION

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries5 marks. Marks

1		What is Load curve. Explain the significance of Load curve.	(5)
2		Derive an expression for the capacitance of a single phase transmission line.	(5)
3		Each line of a 3-phase system is suspended by a string of three similar insulators. If the voltage across the line unit is 17.5kV. Calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is $1/8^{th}$ of the capacitance of the insulator itself. Also calculate the string efficiency.	(5)
4		Explain TCR configuration	(5)
5		A circuit breaker interrupts the magnetising current of 100MVA transformer at 220kV.The magnetising current of the transformer is 5% of the full load current. Determine the maximum voltage which may appear across the gap of the breaker when the magnetising current is interrupted at 53% of its peak value. The stray capacitance is 2500μF.The inductance is 30H.	(5)
6		With the help of a block diagram explain the working of a microprocessor based over current relay.	(5)
7		With help of a neat diagram explain the working of a Buchholz relay.	(5)
8		Distinguish between radial and ring main distribution systems. Enlist their advantages and disadvantages.	(5)

PART B

Answer any twofull questions, each carries10 marks.

9	a)	With a neat figure explain the working of Hydro electric power plant.	(6)
	b)	A power station has a maximum demand of 15000kW.The annual load factor is 50% and capacity factor is 40%. Determine the reserve capacity of the plant.	(4)

10 a) Power Factor of a 3-φ load of 25kW at 415V, 50Hz is to be improved from 0.6 to 0.9. Calculate the value of the capacitance required in each branch , if the capacitor bank is in delta configuration. (6)

b) Explain Ferranti Effect. (4)

11 a) Derive an expression for the inductance of an isolated current carrying conductor. (5)

b) A 15km long 3 phase line has a resistance of 5.31ohms per phase and inductive reactance of 5.54ohms per phase. The sending end voltage is 11kV.The receiving end load is 1200kW at a power factor of 0.8 lagging. Find the receiving end voltage and line current.(Sending end and receiving end are star connected) (5)

PART C

Answer any twofull questions, each carries10 marks.

12 a) A two conductor cable 1km long is required to supply a constant current of 200A throughout the year. The cost of cable including installation is Rs. (20a+20)per metre where a is the area of cross section of the conductor in cm^2. The cost of energy is 5P per kWh and interest and depreciation charges amount to 10%. Calculate the most economical conductor size. Assume resistivity of conductor material is 1.73μΩcm. (5)

b) What is Corona? What are the factors affecting Corona? What are the methods to reduce Corona. (5)

13 a) The capacitances of a 3-phase belted cable are 12.6μF between the three cores bunched together and the lead sheath and 7.4μF between one core and the other two connected to sheath. Find the charging current drawn by the cable when connected to 66kV, 50Hz, star connected supply. (6)

b) What are the advantages of dc transmission over ac transmission. (4)

14 a) Explain the configuration of a TCSC (4)

b) A transmission line at a river crossing is supported by two towers 50m and 55mabove water level. The horizontal distance between towers is 300m. The tension in the conductor is 2000kg and weight of conductor is 0.85 kg/m. a) Find the minimum clearance between conductor and water b) Determine the position of minimum clearance. (6)

PART D

Answer any twofull questions, each carries 10 marks.

15 a) With the help of a neat diagram explain the working of Puffer type SF_6 circuit breaker. (4)

b) In a 220kV system, the reactance and capacitance up to the location of circuit breaker is 8Ω and 0.025μF respectively. A resistance of 600Ω is connected across the contacts of the circuit breaker. Determine the following. (6)

a)Natural frequency of oscillation

b)Damped frequency of oscillation

c) Critical value of resistance which will give no transient oscillation.

16 a) With the help of neat diagram explain the working of a watt hour metre type electromagnetic relay. (5)

b) With the help of a neat diagram explain the working of percentage differential protection used in transformer. (5)

17 a) An 11kV, 100MVA alternator is provided with differential protection. The percentage of winding to be protected against phase to ground fault is 85%. The relay is set to operate when there is 20% out of balance current. Determine the value of the resistance to be placed in the neutral to ground connection. (5)

b) With the help of a neat diagram explain the working of a surge diverter. (5)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech S5 (S) Examination September 2020

Course Code: EE301
Course Name: POWER GENERATION, TRANSMISSION AND PROTECTION

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries5 marks. Marks

1		Explain the general arrangement and operation of a hydro electric power plant.	(5)
2		The receiving end voltage of an unloaded long line may be more than the sending end voltage. Explain this phenomenon with the help of a phasor diagram.	(5)
3		Explain Kelvin's law. What are its limitations?	(5)
4		Describe the phenomenon of corona. Explain any three factors which affect corona loss.	(5)
5		Explain the arc quenching theorems in a circuit breaker.	(5)
6		Explain the fundamental requirements of protective relaying.	(5)
7		Differentiate between surge diverter and surge absorber. What are the characteristics of an ideal surge diverter.	(5)
8		Explain briefly various systems of primary distribution in the case of ac.	(5)

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PART B

Answer any two full questions, each carries 10 marks.

9	a)	Define the term Diversity factor and prove that the load factor of a supply system is improved by an increase in diversity of load.	(5)
	b)	Find the sending end voltage and voltage regulation of a 250 km, 3 phase, 50 Hz transmission line delivering 25 MVA at 0.8 pf lag to a balanced load at 132 kV. The inductance of the line is 1.25mH/km/ph and the shunt capacitance is 0.0095 μF/km/ph. Use nominal π method.	(5)
10	a)	From first principles, derive the equation for the loop inductance of a single phase over head line.	(5)
	b)	A synchronous motor improves the power factor of a load of 250 kW from 0.75	(5)

to 0.9 lagging. Simultaneously the motor carries a load of 100 kW. Find (1) the leading KVAR taken by the motor (2) KVA rating of the motor and pf at which the motor operates.

11 a) With the help of block diagrams explain the working of a solar power plant and a wind power plant. (5)

b) Derive the capacitance of a single phase transmission line, considering the effect of earth. (5)

PART C

Answer any two full questions, each carries 10 marks.

12 a) Explain the configuration of FC+ TCR. (5)

b) A single core cable has a conductor radius 2 cm and inside sheath radius 4 cm. It is provided with one inter heath so that limits of maximum and minimum electric stresses is the same in the two layers of dielectric. The system voltage is 66kV, 3 phase. (5)

Find (a) the radius of inter sheath and its voltage (b) the ratio of maximum electric stress with and without inter sheath.

13 a) Explain the power transfer equations in ac transmission and dc transmission. (5)

b) A string of 5 suspension insulators is to be graded for obtaining uniform voltage distribution across the string. If the pin to earth capacitance are all equal to C and the mutual capacitance of the top insulator is 10 C, find the mutual capacitance of each unit in terms of C. (5)

14 a) Classify the types of HVDC links and explain the construction and working of each type with the help of necessary diagrams. (5)

b) Assuming that the shape of an over head line can be approximated by a parabola, derive the expression for sag. How the effect of wind and ice loadings can be taken into account. (5)

PART D

Answer any two full questions, each carries 10 marks.

15 a) Compare the arc rupture in oil and air blast circuit breakers and summarize the relative advantages and disadvantages of these types of switch gears. (5)

b) With the help of a neat diagram explain the Buchholz's protection for transformers. (5)

16 a) Explain how an amplitude comparator can be converted to a phase comparator and vice versa. (5)

b) What are the causes of over voltages arising on a power system? (3)

c) Explain the term insulation co ordination. (2)

17 a) Draw a neat sketch of an induction disc relay and explain its construction and operation. (5)

b) A dc two wire distributor AB of 300m long is fed at both ends A and B. It supplies uniformly distributed load of 0.15A/m and concentrated loads of 50A, 60A and 40A at distances of 75m, 175m and 225m respectively from the end A. The potentials of feeding points A and B are 206 V and 200 V respectively. The resistance of each wire is 0.00015 ohm/m. Find the currents fed at points A and B. (5)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EE303

Course Name: LINEAR CONTROL SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks. Marks

1 Derive the closed loop transfer function for a non-unity feedback system. (5)

2 Write short notes on Force- voltage and Force – current analogy? (5)

3 Check the stability of the system given by the characteristic equation (5)
$P(s) = s^5 + 2s^4 + 4s^3 + 8s^2 + 16s + 32$

4 What is magnitude and angle criterion? Determine whether the points (-4+j2) is on the root locus of a unity feedback system with forward transfer function $G(s) = \frac{K(s+2)}{s^2 + 4s + 13}$? (5)

5 Define any three frequency response specifications used for the design of control system? (5)

6 Explain how the stability of a system is analysed using Bode plot? (5)

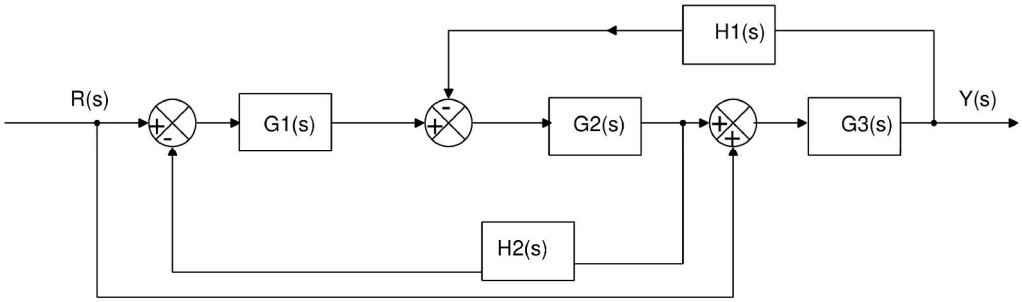
7 State and explain Nyquist stability criterion? (5)

8 Sketch the polar plot of type 1 second order system? (5)

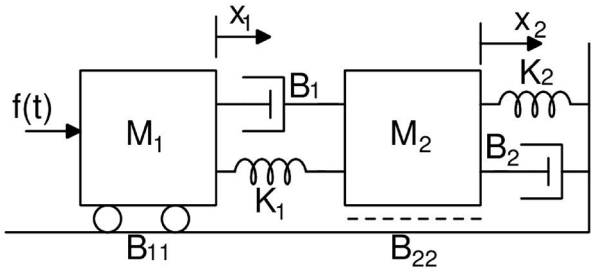
PART B

Answer any two full questions, each carries 10 marks.

9 a) Obtain the transfer function using block diagram reduction techniques. (5)



b) Derive the transfer function forthe mechanical system shown in figure. (5)

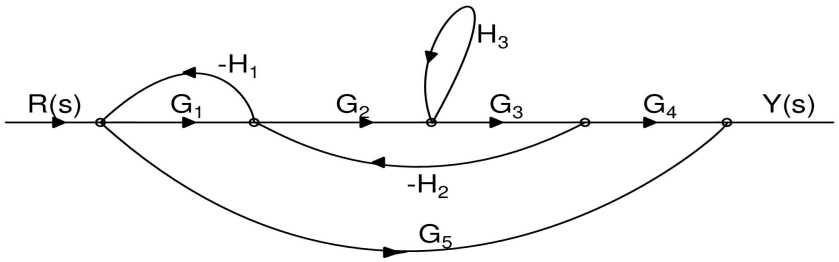


10 a) Derive an expression for the step response of a critically damped second order system? (4)

b) Determine the value of gain K and the natural frequency of oscillation ω_n for the unity feedback system with forward transfer function $G_p(s) = \frac{K}{s(s+10)}$, which results in a critically damped response when subjected to a unit step input. (6)

11 a) A unity feedback system is characterised by an open loop transfer function $G_p(s) = \frac{20}{s^2 + 5s + 5}$. Determine the transient response when subjected to a unit step input and sketch the response. Evaluate the maximum overshoot and the corresponding peak time of the system. (5)

b) For the signal flow graph shown below, determine the transfer function. (5)



PART C

Answer any two full questions, each carries 10 marks.

12 a) Consider a unity feedback system with an open loop transfer function $\frac{K}{s(s+20)}$. Determine the value K which would result in a steady state error of 0.05 for a unit ramp input. (5)

b) Using Routh-Hurwitz criterion determine the value of K for which the closed loop system transfer function $\frac{K}{s^3 + 20s^2 + 80s + K}$ is stable, marginally stable and unstable. (5)

13 Sketch the root locus of a negative feedback system whose open loop transfer function is given by $\frac{K(s+4)}{s(s+1)(s+2)}$. Determine the range of K for which the closed loop system is stable. (10)

14 a) Determine the dynamic error coefficients for a unity feedback system whose open loop transfer function is $\frac{20}{s(s+10)}$, when subjected to an input of $r(t) = 2 + t + 3t^{2.}$. Also compute the steady state error of the system. (6)

a) Discuss about the effect of addition of poles and zeros to the open-loop transfer (4)

function G(s) H(s) on the root locus.

PART D

Answer any twofull questions, each carries 10 marks.

15 a) The open-loop transfer function of a unity feedback system is $\frac{K}{s(0.5s+1)(0.04s+1)}$. Use asymptotic approach to plot the bode diagram and determine the value of K for a gain margin of 10.5 dB (10)

16 Draw the polar plot of open loop transfer function $\frac{6}{(s+1)(s+2)}$ and determine the phase margin and gain margin. (10)

17 a) What is transportation lag in control system? (4)

b) Draw the bode plot for the transfer function given by $\frac{5(s+2)}{s(s+10)}$ .Comment on the stability of the system (6)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: EE303

Course Name: LINEAR CONTROL SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

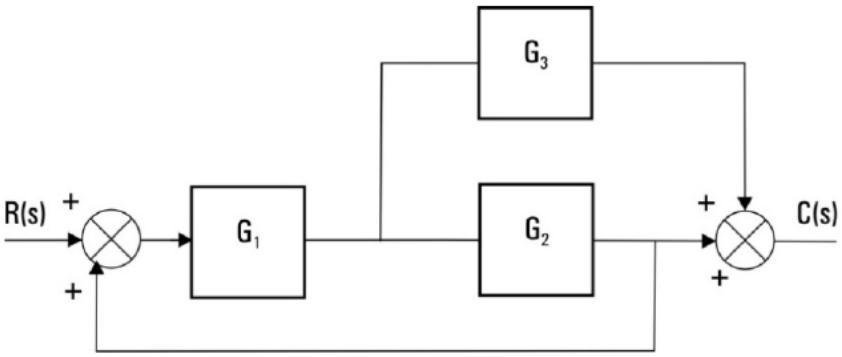
Answer all questions, each carries5 marks.

		Marks
1	Define transfer function and derive the transfer function of an RC network.	(5)
2	With the help of a neat diagram, explain the various time domain specifications.	(5)
3	The open loop transfer function of a unity feedback system is $\frac{9}{(s+1)}$ Using dynamic error coefficients, find an expression for an error if the input r (t) = 1 + 2t +1.5 t^2.	(5)
4	The open loop transfer function of a unity feedback system is $\frac{K}{s-4}$. Find the closed loop poles when k = 0, 1, 2, 3…..10 and mark it on the s- plane. Hence draw the root locus of the system.	(5)
5	Explain Gain margin and Phase margin with the help of bode plot. Mark gain crosses over frequency and phase cross over frequency.	(5)
6	With the help of suitable figure explain frequency domain specifications?	(5)
7	Give two examples of non-minimum phase transfer function. Explain why they are called non-minimum phase system?	(5)
8	Give a physical example of transportation lag. How can it be represented?	(5)

PART B

Answer any two full questions, each carries10 marks.

9 a) Consider the block diagram given in figure below. Draw the signal flow graph corresponding to the block diagram. Find the overall transfer function using Masons Gain Formula. (6)



b) Verify your answer using Block diagram reduction techniques. (4)

10 a) Explain the constructional features and principle of operation of a synchro? (5)

b) What are the advantages of stepper motor? List two applications of the stepper motor? (5)

11 a) Find the step response of a system with transfer function (6)

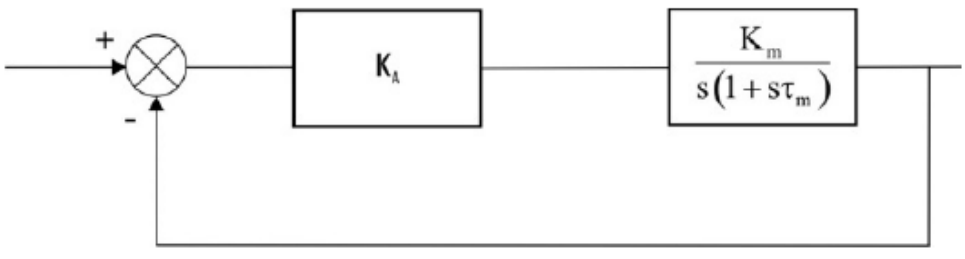
$\frac{4}{s(s+b)+4}$ If b=4 and b =5. Also find the effect of b on damping ratio?

b) With the help of a circuit diagram explain Force – Voltage and Force – Current analogy? (4)

PART C

Answer any two full questions, each carries10 marks.

12 a) Consider the system given in figure below. Given $K_m = 2$ and $T_m = 1$. If $K_A = 1$ find steady state error to step, ramp and acceleration input. (7)



b) What will happen to steady state errors if K_A is increased to 10? (3)

13 a) Explain the significance of angle and magnitude criterion in root locus? (5)

b) Consider a system with characteristic equation $a_0s^3 + a_1 s^2 + a_2s + a_3 =0$; given all coefficients are positive. Derive a sufficient condition for stability. (5)

14 a) The open loop transfer function of a unity feedback system is $\frac{10K}{s(s^2+2s+2)}$ Find the open loop poles? (2)

b) Draw the root locus. Find the range of values of K for which the system is stable. Find all the closed loop poles corresponding to a damping ratio of 0.7 (8)

PART D

Answer any two full questions, each carries 10 marks.

15 a) Sketch the bode plot and find the gain crossover frequency for given $G(s)H(s) = \frac{10}{s(s+5)}$ (6)

b) Given $G(s) = \frac{1}{s^2(s+2)}$ (4)

Find $< G(j\omega)$ at $\omega = 0$

16 The open loop transfer function of a unity feedback system is $\frac{10}{s(s+2)(s+5)}$ Draw the Bode plot and find Gain margin and phase margin? (6)

(4)

17 The open loop transfer function of a unity feedback system is $\frac{2K}{s(s+1)(s+2)}$ Investigate the stability of the system if K =1 using Nyquist stability criteria. Find the range of values of K for which the system is stable (10)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DEC 2019

Course Code: EE303

Course Name: LINEAR CONTROL SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks. Marks

1 Explain Mason's gain formula? (5)

2 Obtain the unit step response of first order system? (5)

3 A unity feedback system has an open loop transfer function $\frac{20(s+5)}{s^2(s+0.1)(s+3)}$. (5)

Determine steady state error for unit parabolic input?

4 Explain the effect of adding poles and zeros on root locus? (5)

5 Sketch the bode plot for given $G(s)H(s)=\frac{10}{s(s+2)}$ without using semi log sheet? (5)

6 Explain about frequency domain specifications? (5)

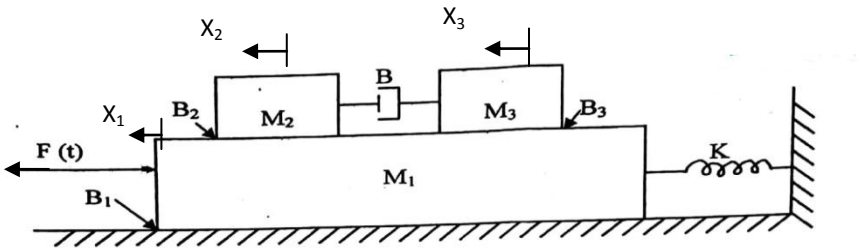
7 Draw the polar plot of type 0 second order system? (5)

8 Explain transportation lag and non-minimum phase systems? (5)

PART B

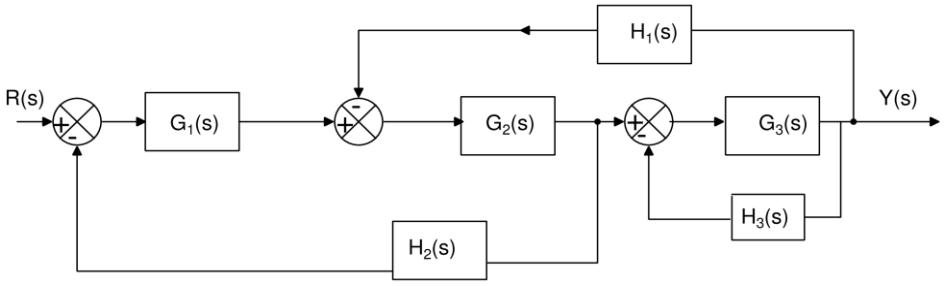
Answer any two full questions, each carries10 marks.

9 a) Write the differential equations governing the mechanical system and hence draw the electrical analogous circuit using F-V analogy and F-I analogy (6)



b) Derive the transfer function of an armature controlled dc motor with block diagram? (4)

10 a) Obtain the overall transfer function using block reduction techniques? (6)



b) What are the standard test signals used for time domain analysis? (4)

11 a) Derive the expression for maximum peak overshoot, rise time and peak time of a second order system for a step input? (6)

b) Explain the construction and working principle of a synchro - transmitter? (4)

PART C

Answer any two full questions, each carries10 marks.

12 a) Evaluate the static error coefficients and steady state error for a unity feedback system having a forward path transfer function $\frac{50}{s(s+10)}$ for the input $r(t)=1+2t+t^2$ (6)

b) Explain important rules for root locus? (4)

13 Sketch the root locus for a unity feedback system with open loop transfer function $\frac{k}{s(s+2)(s+3)}$ and find the range of k for the system to exhibit sustained oscillations? (10)

14 a) Find the location of roots of the characteristic equation (5)

$s^6+4s^5+3s^4-16s^2-64s-48=0$ in LHS, RHS and imaginary axis.

b) Determine (i) type (ii)error constants (iii) steady state error for the parabolic input if the open loop transfer function is $\frac{12(s+2)}{s^2(s^2+7s+12)}$ (5)

PART D

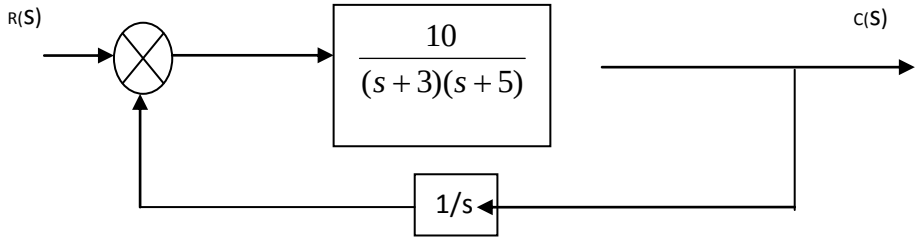
Answer any two full questions, each carries 10 marks.

15 a) Sketch the polar plot for the following transfer function $\frac{10}{s(1+s)(1+0.05s)}$. (6)

b) Explain gain margin and phase margin of a system using Bode plot? (4)

16 Find the value of open loop gain k for G(s)H(s)= $\frac{k}{s(1+0.1s)(1+s)}$ so that the system has a) phase margin of 60^o b) gain margin 15 dB using Bode plot (10)

17 For the system shown in figure determine the stability using Nyquist plot. (10)



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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth semester B.Tech degree examinations (S) September 2020

Course Code: EE303

Course Name: LINEAR CONTROL SYSTEMS

Instructions: Graph sheets and semi log sheets are to be provided

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks. Marks

1 How do you analyse the performance of a mechanical system using electrical analogy? Explain with suitable example for Force- Voltage analogy. (5)

2 With relevant characteristics, explain the applications of synchro transmitter and receiver units? (5)

3 The input to a closed loop system with open loop transfer function $G(s) = \frac{K\,(s+3)}{s\,(s^2+3s+2)}$ consists of a step function and a ramp function as, r(t)= 2 u(t) + t. Determine the value of K such that the steady state error for the system is e_{ss}= 0.1. Determine the static error coefficients also. (5)

4 How do you determine the angle of departure of root locus branch from an open loop pole, using angle criterion. (5)

5 Derive and explain the dependence of damping factor on the resonant peak (M_r) of a second order system? (5)

6 Explain the significance of gain cross over frequency and phase cross over frequency in the system performance with suitable characteristics. (5)

7 State and explain Nyquist stability criterion? (5)

8 Obtain the polar plot and hence determine the value of K such that the system with open loop transfer function $G(s) = \frac{K}{s\,(s+1)(s+4)}$ is marginally stable? (5)

PART B

Answer any two full questions, each carries 10 marks.

9 a) Explain the Mason's gain formula for the derivation of transfer function with a suitable example. (5)

b) Analyse the effect of feedback block H(s) on the characteristic equation and pole-zero locations of the closed loop system having $G(s) = \frac{2}{(s^2 + 4s + 4)}$ with: i) $H(s) = \frac{1}{s}$; ii) H(s) = s (5)

10 a) Determine the unit step response for the system with transfer function $T(s) = \frac{1}{(s^2 + 4s + 5)}$. Also determine peak overshoot (M_p) and peak time (t_p). (6)

b) Explain the features and control applications of Tacho generators. (4)

11 a) Derive the transfer function of the Field controlled DC servo motor and hence explain the system characteristics? (6)

b) How does an automatic control system differ from an open loop system. Mention at least four general control system components required for the modification? (4)

PART C

Answer any two full questions, each carries 10 marks.

12 a) Test the stability of the unity negative feedback system with $G(s) = \frac{16}{s(s^5 + s^4 + 8s^3 + 6s^2 + 20s + 8)}$ using Routh's stability criterion. Hence identify the location of roots of the system. (7)

b) Explain how does the type of the system control the steady state error for a ramp input? (3)

13 Determine the stability of the closed loop system with $G(s)H(s) = \frac{K(s+1)}{(s^2 + 4s + 8)}$ using Root locus plot. Hence, determine the (10)

value of K such that the damping factor is 0.866.

14 a) Determine the value of M using Routh array, such that the system with characteristic equation $q(s) = s^4 + s^3 + M s^2 + 2s + 1$ is stable. (4)

b) With suitable illustrations explain how does addition of zeroes to the transfer function affect the root locus? (6)

PART D

Answer any two full questions, each carries 10 marks.

15 Determine the value of K such that the system with open loop transfer function $G(s)H(s) = \frac{K}{s(s+4)^2}$ is marginally stable, using Bode plot. (10)

16 a) Test the stability using Nyquist criterion, for the system with open loop transfer function $G(s)H(s) = \frac{2}{s(s+2)(s+4)}$ (7)

b) Compare between non minimum phase systems and minimum phase systems? (3)

17 a) With suitable characteristics explain the effects of Transportation lag (e^{-sT}) on Bode plot (5)

b) Explain the salient features and advantages of Nichols chart in Control system design. (5)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

V SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EE305

Course Name: POWER ELECTRONICS

Max. Marks: 100 Duration: 3 Hours

Graph sheets may be supplied on demand

PART A

Answer all questions, each carries 5 marks. Marks

1. Define holding current and latching current of SCR. Show these currents on the static IV characteristics of SCR. (5)
2. With the help of circuit diagram and waveform, explain the operation of RC triggering circuit for one thyristor. (5)
3. A three phase half wave converter is operated from 3–phase, 230 V, 50Hz supply with load resistance R= 10Ω. An average output voltage of 50% of the maximum possible output voltage is required. Determine i) the firing angle, ii) average and rms values of load current. (5)
4. With the help of circuit diagram explain the working of current source inverter. (5)
5. What is pulse width modulation? List the various PWM techniques. (5)
6. Explain the principle of phase control in a single phase ac voltage controller. (5)
7. Draw the circuit of step up chopper and explain its working. (5)
8. For a type A chopper, dc source voltage is 230 V, load resistance 10 Ω, drop across the switch is 2Vand duty cycle 0.4. Calculate average and RMS value of output voltage and chopper efficiency. (5)

PART B

Answer any two full questions, each carries10 marks.

9 a) Discuss the condition which must be satisfied for turning on the SCR with a gate signal. (5)

b) Explain the significance of di/dt protection in thyristors and describe the method employed for improving the same. (5)

10 With the help of circuit diagram explain the working of single phase fully controlled converter with RL load. Draw the waveform of output voltage with and without freewheeling diode and output current. (10)

11 a) What are the steps to be employed to prevent the difficulties of parallel operation of thyristors? (4)

b) With the help of circuit diagram explain the operation of single phase semi converter with RL load. Draw the waveform of input voltage, output voltage, load current and voltage across the thyristor. (6)

PART C

Answer any two full questions, each carries10 marks.

12 a) With the help of circuit diagram explain the working of three phase fully controlled converter. (5)

b) Sketch the waveform of input voltage, output voltage and output current of a three phase fully controlled converter with R load operating at $\alpha = 30^o$. (5)

13 a) Describe the working of a three phase voltage source inverter with an appropriate circuit diagram. (4)

b) Draw the phase and line voltagewaveform of the three phase voltage source inverter with star connected resistive load on the assumption that each IGBT conducts for 180^o (6)

14 a) With the help of circuit diagramexplain the working of single phase dual converter with circulating current mode. (5)

b) Write Fourier series expression for the output voltage from the single phase half bridge and full bridge inverter and determine the equation for THD. (5)

PART D

Answer any two full questions, each carries 10 marks.

15 a) Explain with suitable diagram, the principle of voltage control with single pulse width modulation. (5)

b) With the help of circuit diagram explain the working of single phase ac voltage controller with R load. (5)

16 a) A step up chopper has input voltage of 120V and output voltage of 360 V. If the conducting time of the thyristor chopper is 100 μs, Compute the pulse width of output voltage (5)

b) With the help of circuit diagram and waveform explain the operation of buck converter and derive the equation of output voltage. (5)

17 a) Describe how multiple pulse modulated wave can be generated from carrier and reference wave. (5)

b) Explain the design procedure of filter circuit for a boost converter with continuous current mode (5)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

V SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: EE305

Course Name: POWER ELECTRONICS

Max. Marks: 100 Duration: 3 Hours

Graph sheet may be supplied on demand

PART A

Answer all questions, each carries5 marks. Marks

1. Draw static characteristics of SCR, and based on that explain different modes of operation of SCR. (5)
2. With the help of circuit diagram and waveform explain the operation of UJT triggering circuit for one thyristor. (5)
3. Draw the circuit and derive the expression for output voltage of a single phase bridge converter. (5)
4. Differentiate between voltage source inverter and current source inverter. (5)
5. With the help of waveform explain sinusoidal pulse width modulation used in single phase inverter. (5)
6. Derive the equation for power factor for a single phase ac voltage controller feeding a resistive load. (5)
7. Explain the necessity of filter in chopper circuit. (5)
8. Describe the working of type B chopper. (5)

PART B

Answer any twofull questions, each carries10 marks.

9 a) Explain with figures the switching characteristics of SCR during turn on and turn off. (5)

b) With help of detailed structure explain the operation of MOSFET. (5)

10 a) With the help of circuit diagram and waveform explain the operation of RC triggering circuits for one SCR and also draw the voltage across the SCR. (5)

b) Differentiate between features of UJT firing circuit, RC triggering circuit and R triggering circuit. (5)

11 a) Mention the important ratings of the thyristors along with their significance. (5)

b) A battery is charged through a single phase half wave controlled converter. The supply voltage is 230 V, 50 Hz and battery emf is constant at 160 V. Find the value of average charging current for firing angle of 30 degrees. Internal resistance of battery is 2 Ω. (5)

PART C

Answer any twofull questions, each carries10 marks.

12 a) With the help of circuit diagram explain the working of three phase semi controlled converter. (5)

b) Sketch the waveform of input voltage, output voltage and output current of the three phase fully controlled converter with R load with $\alpha = 0^o$ (5)

13 a) Describe the working of a three phase voltage source inverter with an appropriate circuit diagram. (5)

b) Draw the phase and line voltage waveform of the three phase voltage source inverter with star connected resistive load on the assumption that each IGBT conducts for 120^o. (5)

14 a) A single phase bridge inverter fed from 200 V dc, is connected to an RL load of R = 9 Ω and L = 0.04 H. Determine the power delivered to the load in case the inverter is operating at 50 Hz with square wave output. (5)

b) With the help of circuit diagram explain the working of single phase dual converter with circulating current mode. (5)

PART D

Answer any twofull questions, each carries 10 marks.

15 a) Explain different methods for controlling the voltage at the output terminals of an inverter. (5)

b) With the help of circuit diagram explain the working of single phase ac voltage controller with R load. (5)

16 a) Explain the sinusoidal pulse width modulation used in single phase inverter and draw its waveform. (5)

b) Draw the circuit of buck boost converter and explain its working. (5)

17 a) Explain different types of chopper. (5)

b) A step up chopper has input voltage of 220V and output voltage of 400 V. If the conducting time of the switch is 100 μs, Compute the pulse width of output voltage. (5)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: EE305

Course Name: POWER ELECTRONICS

Max. Marks: 100 Duration: 3 Hours

Graph sheet may be supplied on demand

PART A

Answer all questions, each carries5 marks. Marks

1		Sketch the static VI characteristics of SCR and define latching current and holding current.	(5)
2		Describe briefly the RC triggering circuit for SCR with a neat circuit diagram. With the help of a graph explain how firing angle control up to 180 degrees is obtained.	(5)
3		Explain the operation of three-phase dual converter with circulating current..	(5)
4		Sketch the diagram and output voltage waveform of a single phase half bridge Voltage Source Inverter with R load and describe the working.	(5)
5		Define modulation index and Frequency modulation ratio.	(5)
6		What are the control strategies for the regulation of output voltage in AC Voltage Controllers?	(5)
7		Explain the different methods by which control of output voltage is obtained in Choppers.	(5)
8		Derive the expression for the voltage gain in a Boost regulator.	(5)

PART B

Answer any two full questions, each carries10 marks.

9	a)	Compare the characteristic features of MOSFET AND IGBT	(4)
	b)	Give the structure and operation of TRIAC.	(6)
10	a)	Describe a single phase half controlled converter with RL load along with necessary circuit diagram and waveforms.	(4)
	b)	With neat circuit diagram explain the operation of a Single Phase Half Wave Rectifier with R, load. Sketch the shape of output voltage waveform.	(6)
11	a)	Explain how di/dt and dv/dt protection is accomplished in SCR.	(4)

b) A fully controlled full wave converter has a source of 240 V rms, 50 Hz and 10 Ω, 50mH, 50V Emf opposing series load. The delay angle is 45^o. Determine (6)

a) Average output voltage and current.

b) Rms load voltage and Rms voltage across the RL part of the load.

c) The power absorbed by the 50V load back emf.

PART C

Answer any twofull questions, each carries10 marks.

12 Sketch the circuit diagram and explain the working of a 3 phase full wave controlled rectifier with RLE load. Draw the output voltage waveforms corresponding to $\alpha = 60^o$, $\alpha = 90^o$ and $\alpha = 150^o$ (10)

13 Draw the circuit and explain the 180^o operation of a 3 phase bridge inverter with R load. Draw the phase voltage and line voltage waveforms. (10)

14 a) With necessary waveforms explain the working and four quadrant operation of a single phase circulating current type Dual converter. (5)

b) Differentiate a Current source inverter from a Voltage source Inverter. (5)

PART D

Answer any twofull questions, each carries 10 marks.

15 Explain with relevant waveforms a Single phase AC voltage controller with RL load. (10)

16 How four-quadrant operation is achieved in a Type E Chopper? Explain with neat circuit diagram. (10)

17 a) What is meant by Pulse Width Modulation? Describe the various PWM techniques used in Voltage control of Inverters. (5)

b) Explain Sequence control with R load. (5)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth semester B.Tech degree examinations (S) September 2020

Course Code: EE305

Course Name: POWER ELECTRONICS

Max. Marks: 100 Duration: 3 Hours

Graph sheets will be provided

PART A

Answer all questions, each carries 5 marks. Marks

1 Draw the static VI characteristics of a SCR and explain. (5)

2 Explain R firing circuit of SCR with circuit diagram and waveforms. (5)

3 Draw the output voltage waveform of a 3-phase controlled half wave rectifier for $\alpha=30^0$. (5)

4 Explain the working of a single phase half bridge voltage source inverter with pure R load. Draw the output voltage & output current waveforms and derive an expression for rms output voltage. (5)

5 For a single phase ACVC with source voltage as$v_s = 100sin\omega t$, and load as$R = 50\Omega$, draw the output voltage and current waveforms if Thyristor firing angle is (i) $\alpha=30^0$ (ii) $\alpha=90^0$. (5)

6 Define the terms amplitude modulation index and frequency modulation index. (5)

7 Draw the waveform of inductor voltage of a boost dc-dc converter and obtain an expression for output dc voltage in terms of input voltage and duty cycle. (5)

8 In a step down chopper the dc input voltage is of *100V*. The MOSFET switch is having a switching frequency of 2*kHz.* Find the duty cycle and average dc output voltage if the turn on period of switch is *0.2ms.* (5)

PART B

Answer any two full questions, each carries 10 marks.

9 Deduce the Two Transistor Model for a Thyristor and explain the Thyristor operation using this model. (10)

10 a) Describe the variation of current and voltage during turn- on time of an SCR with the help of characteristics. (5)

b) With circuit diagram and relevant waveforms, explain the operation of UJT firing circuit for triggering a SCR. (5)

11 a) Illustrate how a Thyristor based 1-phase fully controlled rectifier can be used to convert ac into variable dc. Draw the waveforms of output voltage & output current for both R and RL load at $\alpha=30^0$. (6)

b) Obtain an expression for average dc output voltage of a 1-phase fully controlled rectifier for R load with firing angle, α. (4)

PART C

Answer any two full questions, each carries 10 marks.

12 Describe the operation of a 3-phase semi-converter with RLE load having constant output current when firing angle is 30^0 with output voltage waveform and derive an expression for average dc output voltage. (10)

13 a) Explain how four quadrant operation is possible using a 1-phase dual converter operating in both circulating and non-circulating current modes. (5)

b) A 50Hz single phase full bridge square wave inverter is fed form 500V dc input. Find output rms voltage and current for a load of R=5Ω and L=10mH. (5)

14 Illustrate the operation of a 3-phase bridge inverter operating in 180^0 conduction mode with output line voltage and phase voltage waveforms. Derive expressions for output line voltage and phase voltage. (10)

PART D

Answer any two full questions, each carries 10 marks.

15 Illustrate the generation of sine pulse width modulated control signals for a single phase VSI with output voltage waveform. (10)

16 a) Describe the operation of single phase AC voltage controller for R load with waveforms and derive expression for output rms voltage. (5)

b) For a dc-dc buck-boost converter with a dc input voltage of *50V* and output voltage of 100V, calculate (i) duty cycle (ii) value of inductor if inductor ripple current ΔI =10mA. Given the switching frequency is 10kHz (5)

17 With circuit diagram and waveforms, describe the operation of a buck-boost dc-dc converter. Derive expressions for output dc voltage and the design equations for filter inductor & capacitor. (10)

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EE307

10 (a)

Please read the equation in the last line as shown below:

$x(t) = \frac{3}{5}\ e^{-2t}\ u(t)$

Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

V SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EE307

Course Name: SIGNAL AND SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries5 marks. Marks

1 Check whether the discrete-time system $y[n] = x[n^2]$ is dynamic, causal and time invariant. (5)

2 Solve the differential equation $\dot{x} + 2x = e^{-3t}, x(0) = 0$ using Laplace transform method. (5)

3 Find the Fourier transform of $x(t) = u(t)$ (5)

4 An analog signal is expressed by the equation $x(t) = 15\cos 50\pi t + 15\sin 300\pi t + 10\sin 100\pi t$. Calculate the Nyquist rate (minimum sampling rate) in Hz for this signal. (5)

5 Find the z-transform of $x[n] = \cos(\omega n)u(n)$. (5)

6 State and prove the time shifting property of Z-transform. (5)

7 State and prove time reversal property of discrete time Fourier series (DTFS). (5)

8 Describe random signals with examples. (5)

PART B

Answer any two full questions, each carries 10 marks.

9 a) Check whether the following signals are periodic or not. If periodic, find the period. (5)

i) $x(t) = \sin 0.5\pi t + \cos 0.5t$ ii) $x[n] = e^{j\frac{2\pi}{3}n} + e^{j\frac{2\pi}{5}n}$

b) Find the odd and even parts of the signal $x(t) = 1 + t + 3t^2 + 5t^3 + 9t^4$ (5)

10 Draw the pole-zero plot of the following function in s-domain and hence find the time domain response. (10)

$$F(s) = \frac{2}{s(s^2 + 2s + 2)}$$

11 a) Determine whether the system $y[n] = n \times x[n]$ is i) linear ii) time invariant iii) dynamic and iv) causal. (5)

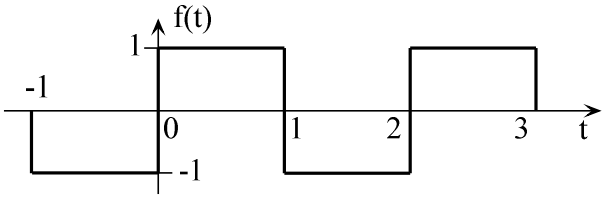
b) Derive the condition for causality and stability in terms of impulse response of (5)

a continuous time linear time invariant system.

PART C

Answer any two full questions, each carries 10 marks.

12 a) Find the exponential Fourier series of the waveform shown in figure. Also plot the magnitude spectrum with n=0,1,2,3,4 and 5. (7)



b) State and prove the time differentiation property of continuous time Fourier transform (CTFT). (3)

13 State and prove sampling theorem. Also, explain aliasing. (10)

14 a) Find the frequency response for the following linear time invariant system and hence find the impulse response. (5)

$\frac{dy(t)}{dt} + 2y(t) = x(t)$. Also find the output y(t) if the input is $x(t) = e^{-t}u(t)$

b) Find the linear convolution $y[n] = x[n] * h[n]$ if $x[n] = \delta(n+1) + \delta(n) + \delta(n-1)$ and $h[n] = 2\delta(n+1) + \delta(n) + 2\delta(n-1)$. (5)

PART D

Answer any two full questions, each carries 10 marks.

15 a) Find Z-transform and ROC of $x[n] = u(-n-1) + \left(\frac{1}{2}\right)^n u(n)$. (6)

b) State and prove the initial value theorem of Z-transforms. (4)

16 a) A causal discrete time system is described by $y[n] = \frac{3}{4}y[n-1] - \frac{1}{8}y[n-2] + x[n]$. Find the frequency response and impulse response. (7)

b) Find the discrete time Fourier series (DTFS) of $x[n] = \{1, -1\}$. (3)

17 a) A causal LTI system is described by the difference equation $y[n] - \frac{1}{2}y[n-1] = 2x[n-1]$. Find the transfer function and impulse response of the system. (5)

b) Classify the various physical non-linearities in systems. (5)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

V SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: EE307

Course Name: SIGNAL AND SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries5 marks. Marks

1 Differentiate between energy and power signals with example. (5)

2 Find the Laplace transform and ROC of the signal $x(t) = e^{-3t}u(t) + e^{-2t}u(t)$. (5)

3 State and prove Parseval's theorem for energy signals. (5)

4 Briefly explain zero order and first order hold circuits. (5)

5 Find the Z transform and ROC of the signal $x(n) = a^n u(n)$. (5)

6 State and prove initial value theorem of Z transform. (5)

7 Find the convolution of the given signals using DTFT. (5)

$x_1(n) = \frac{1}{2}^n u(n) \quad x_2(n) = \frac{1}{3}^n u(n)$

8 Explain different types of nonlinearities present in the system. (5)

PART B

Answer any twofull questions, each carries10 marks.

9 Explain the different types of signals with example. (10)

10 A continuous time LTI system is described by the differential equation $\frac{d^2y(t)}{dt^2} + 7\frac{dy(t)}{dt} + 12y(t) = x(t)$. Determine the impulse response and step response given $y(0) = -2, \; y^{|}(0) = 0.$ (10)

11 Define LTI system. Check the causality, time invariance and linearity of the system $y(n) = x(n^2)$. (10)

PART C

Answer any twofull questions, each carries10 marks.

12 Obtain the trigonometric Fourier series representation of a full wave rectifier given $x(t) = \sin t$. (10)

13 a) What is meant by convolution sum? Find the convolution sum given (5)

$x(n) = 2\delta(n+1) - \delta(n) + \delta(n-1) + 3\delta(n-2)$

b) Find the Exponential Fourier Transform of cos ωt (5)

14 State and prove the properties of Fourier transform. (10)

PART D

Answer any twofull questions, each carries 10 marks.

15 Find the inverse z transform using residue method (10)

$X(z) = \frac{1+3z^{-1}}{1+3z^{-1}+2z^{-2}}$; |z|>2

16 a) Determine the DTFT of $x(n) = 2^n u(n)$. (6)

b) Write a note on Random signals and random processes. (4)

17 a) Find the initial and final values of $X(z) = \frac{z-2}{(z-1)(z-3)}$. (5)

b) Define Properties of Fourier Series (any five) representation of Disrete Time Signals (5)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: EE307

Course Name: SIGNALS AND SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries5 marks. Marks

1 Define unit ramp function. Plot $r(t)$ and $x(t) = -4r(t)$ (5)

2 Find the unilateral Laplace transform and ROC of $x(t) = e^{-t}u(t) + e^{4t}u(t)$ (5)

3 If Fourier transform of $x(t)$ is $X(w)$, derive the Fourier transform of $\frac{dx(t)}{dt}$ (5)

4 Plot a) $u[n]$ and b) $x[n] = u[n+2] \times u[-n+2]$ (5)

5 Consider the sequence $x[n] = a^n$, if $x[n]$ is a causal sequence prove that the ROC of X(z) is the exterior of the circle of radius $'a'$, where X(z) is the Z transform of x[n]. (5)

6 State and prove the linearity and time reversal properties of Z-transform (5)

7 Determine whether Fourier series representation is possible for the discrete time signals $a)\ x[n] = 2cos\sqrt{5}\pi n\ and\ b)\ x[n] = 4cos\frac{n\pi}{2}$. If possible find the fundamental period and frequency (5)

8 Find the frequency response $H(w)$ given, $y[n] = \frac{1}{2}\{x[n] + x[n-2]\}$ (5)

PART B

Answer any two full questions, each carries10 marks.

9 a) Find whether the system $y(t) - at^2x(t) + btx(t-4)$ is a) static b) linear c) causal and d) time invariant (6)

b) Given $x(t) = e^{-3t}u(t)$. Find the output of the system if the impulse response of the system is given by $h(t) = u(t+3)$ (4)

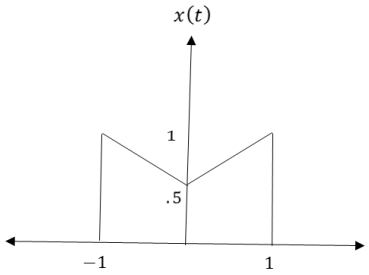
10 a) A $1k\Omega$ resistor is connected in series with $200\mu F$ capacitor. Using Laplace transform find the voltage across the capacitor $y(t)$ if the voltage input is (6)

$x(t) = \frac{3}{5}e^{-2t}u(t)$ with the initial condition $y(0) = -2$

b) Consider and LTI system described by the differential equation (4)
$\frac{dy(t)}{dt} + 5y(t) = \frac{d^2x(t)}{dt^2} + \frac{dx(t)}{dt} - 2x(t)$. Find the transfer function of the inverse system and find out whether a stable and causal inverse system exists.

11 a) Using bilateral Laplace transform find the ROC of the signal $x(t) = e^{-b|t|}$ for a) (6)
b>0 and b) b<0

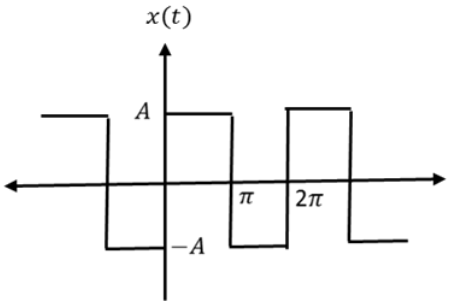
b) For $x(t)$ given below, plot $x(-2t-1)$ (4)



PART C

Answer any two full questions, each carries10 marks.

12 a) Find the exponential Fourier series and plot the magnitude and phase spectrum of (10)
the following waveform.



13 a) Define sampling theorem. With the help of frequency spectrum explain signal (6)
reconstruction is possible only if sampling frequency is $f_s \geq 2f_m$

b) Using Fourier transform property find the Fourier transform of (4)
$x(t) = e^{-3t}u(t-2)$

14 a) Using graphical method find the convolution of $x[n] = \{1,3,3,2\}$ and (6)
$h[n] = u[n] - u[n-4]$

b) The impulse response of a system is given by $h[n] = 3^n u[-n]$. Find whether the system is causal, stable and dynamic (4)

PART D

Answer any two full questions, each carries 10 marks.

15 a) Determine the causal signal $x[n]$, if the Z-transform of the signal is given by (6)

$X(z) - \frac{1}{(1+z^{-1})(1+z^{-1})^2}$

b) An LTI system has the impulse response $h[n] = \left(\frac{1}{2}\right)^n u[n]$. Determine the input of the system if the output is $y[n] = \left(\frac{1}{2}\right)^n u[n] + \left(\frac{-1}{2}\right)^n u[n]$ (4)

16 a) Find the Z-transform and ROC of $x[n] = n\left(\frac{-1}{2}\right)^n u[n] * \left(\frac{1}{4}\right)^{-n} u[-n]$. Symbol * represents convolution (6)

b) If a discrete time periodic signal has periodicity N, write its Fourier series representation. Write down any three differences between continuous time and discrete time Fourier series (4)

17 The impulse response of a discrete time system is given by $h[n] = \frac{1}{2}\delta[n] + \delta[n-1] + \frac{1}{2}\delta[n-2]$. Find the system frequency response $H(w)$ and plot the magnitude and frequency spectra (10)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth semester B.Tech degree examinations (S) September 2020

Course Code: EE307

Course Name: SIGNAL AND SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries5 marks. Marks

1		Check whether the given signal $x(t) = e^{-3t}u(t)$ is an energy or power signal.	(5)
2		Find the ROC of the signal $x(t) = e^{-b\|t\|}$ using Laplace transform.	(5)
3		State and prove the convolution property of Fourier transform.	(5)
4		Briefly explain sampling process and sampling theorem.	(5)
5		Find the initial and final values of $X(z) = \frac{(2z+4)(3z+5)}{(z+2)(4z+5)}$.	(5)
6		State and prove time delay theorem of Z transform.	(5)
7		Find the DTFT of the sequence $x(n) = 5nu(n)$.	(5)
8		Explain different types of nonlinearities present in the system.	(5)

PART B

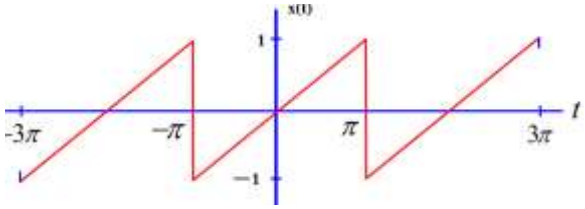
Answer any two full questions, each carries10 marks.

9		Briefly explain the classification of different types of systems with example.	(10)
10	a)	A continuous time LTI system is described by the differential equation $\frac{d^2y(t)}{dt^2} - \frac{dy(t)}{dt} - 2y(t) = x(t)$. Find the impulse response using Laplace transform, if the system is stable . Assume zero initial conditions.	(5)
	b)	Find the inverse Laplace transform of $X(s) = \frac{2}{(s+4)(s-1)}$ if ROC is i) Re(s) >1 ii) Re(s) <-4 iii) -4 < Re(s) <1	(5)
11	a)	Determine whether the system $y(t) = t^2x(t-1)$ is linear, time invariant or both.	(6)
	b)	Check whether the given signal $x(t) = 2\cos(10t+1) - \sin(4t-1)$ is periodic or not and find the fundamental period if the signal is periodic.	(4)

PART C

Answer any two full questions, each carries 10 marks.

12 Obtain the trigonometric Fourier series representation of the waveform shown below. (10)



13 a) Briefly explain sampling theorem and signal reconstruction. (4)

b) Find the output signal $y(n)$ if the input sequence is $x(n) = \{1,4,3,2\}$ and $h(n) = \{1,3,2,1\}$. (6)

14 The input and output of a causal LTI system is related by the differential equation $\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = 2x(t)$. Find the impulse response of the system and also find the unit step response if $x(t) = te^{-2t}u(t)$. (10)

PART D

Answer any two full questions, each carries 10 marks.

15 a) State and prove properties of Z transform. (10)

16 a) Find the DTFS representation for $x(n) = 5 + \sin\frac{n\pi}{2} + \cos\frac{n\pi}{4}$. (5)

b) Evaluate the integral $\int_{-\pi}^{\pi} \left| \frac{1}{1 - \frac{e^{-j\omega}}{4}} \right|^2 d\omega$ using Fourier transform (5)

17 a) Find the inverse Z transform $X(z) = \frac{z}{(z-1)(z-2)(z-3)}$ using partial fraction method. (6)

b) Find the Z transform and ROC of the signal $x(n) = a^n u(n)$. (4)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EE309

Course Name: MICROPROCESSOR AND EMBEDDED SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries5 marks. Marks

1		Explain the following pins in 8085 Microprocessor. i) HOLD ii) READY iii) TRAP iv) ALE	(5)
2		Explain how delay is generated using one register and calculate how much delay can be generated if one register is loaded with maximum count. Assume time for one state is 320ns.	(5)
3		Explain the interrupts in 8085 Microprocessor.	(5)
4		Give comparison between Microprocessors and Microcontrollers.	(5)
5		Explain the following instructions used in 8051 microcontroller. i) MOV R_1, #05_H ii) ADD A, #01_H iii) MOV R_2, 07_H iv)DJNZ R_2,loop	(5)
6		Explain with neat diagram the RAM of 8051.	(5)
7		Explain the Data types and Directives of 8051 Microcontroller.	(5)
8		Write a program to create a square wave of 50% duty cycle on the P1.5 bit . Timer 0 is used to generate the time delay.	(5)

PART B

Answer any two full questions, each carries10 marks.

9	a)	Write an ALP in 8085 to find the smallest number in an array	(5)
	b)	Draw the timing diagram for Memory Read operation.	(5)
10		Explain with neat block diagram the architecture of Intel 8085 Microprocessor.	(10)
11	a)	Explain CALL & RETURN instructions in 8085.	(5)
	b)	Explain Machine Cycle and Instruction Cycle	(5)

PART C

Answer any two full questions, each carries10 marks.

12	a)	Explain with suitable diagram, how an ADC can be interfaced with 8085 Microprocessor.	(6)
	b)	Explain Software and Hardware interrupts in 8085 Microprocessor.	(4)

13	a)	Draw an Interface circuit of 2048 x 8 bit RAM with 8085 using NAND Gate.	(5)
	b)	Explain general characteristics of Embedded system.	(5)
14	a)	Explain i) Compiler ii) Assembler iii) Linker iv) Loaders.	(8)
	b)	What are the demerits of Waterfall Model?	(2)

PART D

Answer any two full questions, each carries 10 marks.

15		Explain with neat block diagram the architecture of 8051 Microcontroller.	(10)
16	a)	Explain SFR registers in 8051 microcontroller.	(5)
	b)	Explain TMOD and TCON registers of 8051 Microcontroller.	(5)
17		Write an ALP in 8051 to add two 32 bit numbers & store the result.	(10)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: EE309

Course Name: MICROPROCESSOR AND EMBEDDED SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks. Marks

1		The contents of accumulator and B-register are $2A_H$ and AB_H respectively. Find the contents of A-register and flags after the execution of instruction ADD B.	(5)
2		Write a delay subroutine program in 8085 using one register. Find the maximum delay obtained under this condition. Assume time for one T state is 320ns.	(5)
3		Explain different mode of operation of 8255.	(5)
4		Differentiate between Assembler and Compiler.	(5)
5		List out different bit handling instructions in 8051 and explain its operations.	(5)
6		Explain the addressing modes of 8051 microcontroller with examples.	(5)
7		Write an ALP in 8051 to add two 16 bit numbers.	(5)
8		Explain assembler directives in 8051.	(5)

PART B

Answer any two full questions, each carries10 marks.

9		Write an ALP in 8085 to convert Binary number to BCD number.	(10)
10	a)	Explain machine cycle and T State in 8085.	(5)
	b)	Explain the significance of stack memory while executing CALL and RET instructions.	(5)
11	a)	Draw the timing diagram for the instruction INR M.	(6)
	b)	Explain the operation of the following instructions in 8085 (i)MOV A,M (ii)XCHG	(4)

PART C

Answer any two full questions, each carries10 marks.

12		Design a memory interface of 2K ROM and 4K RAM with 8085 using 2Kx8bit memory chips.	(10)
13		Explain the Life cycle management of embedded product development.	(10)
14	a)	Draw the interrupt structure of 8085.	(6)
	b)	Differentiate between Microprocessor and Microcontroller	(4)

PART D

Answer any two full questions, each carries 10 marks.

15 Explain with neat block diagram the architecture of Intel 8051 microcontroller. (10)

16 Write an ALP in 8051 to create a square wave with ON time 3ms and OFF time 10ms, on all pins of port 0. Assume XTAL-11.05MHz. (10)

17 a) Explain different bit jump and byte jump instructions in 8051. (4)

b) Explain SCON and SBUF registers in 8051. (6)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: EE309

Course Name: MICROPROCESSOR AND EMBEDDED SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries5 marks. Marks

1		Explain subroutine CALL and RET instructions in 8085	(5)
2		Explain the operation of following instructions (i) MVI C,05H (ii)INR H (iii)MOV A,B (iv) CMA	(5)
3		Explain briefly the control word in 8255 PPI.	(5)
4		Differentiate between hard & soft real time systems.	(5)
5		Write the 8-bit PSW register in 8051. Explain how register banks are selected using PSW register.	(5)
6		Explain I/O ports and its functions in 8051.	(5)
7		Write an ALP in 8051 to generate a square wave of 50% duty cycle on bit 0 of port 1 using Timer 0.	(5)
8		Find the values of TMOD registers to operate as timers in the following modes (i)Mode 1 Timer 1 (ii) Mode 2 Timer 0	(5)

PART B

Answer any twofull questions, each carries10 marks.

9	a)	Explain addressing modes in 8085 with examples.	(6)
	b)	Explain the function of following pins in 8085. (i)ALE (ii)TRAP	(4)
10		Draw the timing diagram of instruction STA $4500_{H.}$	(10)
11	a)	Write an ALP in 8085 to find the largest number from an array of numbers.	(6)
	b)	Explain Fetch cycle & Execute cycle in 8085.	(4)

PART C

Answer any twofull questions, each carries10 marks.

12	a)	Show how a DAC can be interfaced with 8085 Microprocessor.	(7)
	b)	Explain software and hardware interrupts.	(3)
13	a)	Differentiate between Microprocessor and Microcontroller.	(5)
	b)	List the field of applications for an embedded system.	(5)

14 a) Explain with neat functional block diagram the operation in 8255 PPI (6)

b) List out the challenges in Embedded Systems. (4)

PART D

Answer any twofull questions, each carries 10 marks.

15 Explain with neat diagram the Register organisation and SFR in 8051. (10)

16 Write an 8051 C program to toggle all the bits of P0 & P2 continuously with a 250ms delay. (10)

17 a) Write an ALP in 8051 to generate a square wave of 50% duty cycle on the P1.5 bit. Use Timer 0 to generate the time delay. (6)

b) Explain the following instructions in 8051. (4)

(i)MOV A,@R_0(ii) JNB $TF_{0,}$ again

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth semester B.Tech degree examinations (S) September 2020

Course Code: EE309

Course Name: MICROPROCESSOR AND EMBEDDED SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks. Marks

1		Differentiate between 1 byte, 2 byte and 3-byte instructions of 8085 with suitable examples	(5)
2		Sketch the timing diagram of STA 4500	(5)
3		Explain the Mode 1 operation of 8255	(5)
4		Compare microprocessor and microcontroller	(5)
5		List any five bit manipulation instructions of 8051	(5)
6		Explain different addressing modes of 8051	(5)
7		Explain the TMOD register of 8051	(5)
8		Write an ALP in 8051 to divide two numbers and store the result in memory locations 4500 and 4501.	(5)

PART B

Answer any two full questions, each carries 10 marks.

9	a)	Write an ALP in 8085 to sort an array of numbers in ascending order.	(5)
	b)	Explain in detail the stack related operations in 8085	(5)
10	a)	Explain the instruction (i) LDAX Rp (ii) RAL	(5)
	b)	Find the count to be loaded in a register pair to obtain a delay of 2500 μs. Assume clock frequency as 3 MHz	(5)
11	a)	Draw the internal architecture of 8085	(5)
	b)	Explain the various machine cycles of 8085	(5)

PART C

Answer any two full questions, each carries10 marks.

12	a)	Illustrate the application of SIM instruction in 8085 microprocessor	(5)
	b)	List the challenges and current trends in embedded system design	(5)

13	a)	Design an interfacing circuit for one 8K RAM and one 8K EPROM with 8085 microprocessor and find the memory address range	(5)
	b)	Explain compiler, assembler, linker and loader	(5)
14	a)	Explain the interfacing of DAC with 8085 and write a program to generate a saw tooth waveform continuously	(8)
	b)	What are the demerits of waterfall model	(2)

PART D

Answer any two full questions, each carries 10 marks.

15	a)	List the various registers of 8051	(5)
	b)	Explain SCON register 8051	(5)
16	a)	Differentiate between AJMP, LJMP and SJMP	(3)
	b)	Write a timer program to output a square pulse at 50% duty cycle through P3.1	(7)
17	a)	Explain the port structure of 8051.	(4)
	b)	Write a program to serially output “A” at 9600 baud rate	(6)

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