Reg No.:__________________________ Name:__________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B. TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: EE203
Course Name: ANALOG ELECTRONIC CIRCUITS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

1. Design a clamper circuit using diode to obtain sine wave output with its negative peak clamped to +2.6V. (Assume diode drop as 0.6V). (5)

2. Why does the gain of a transistor amplifier vary with frequency? Sketch the frequency response of CE amplifier. (5)

3. Why negative feedback is utilised in amplifiers? How various parameters of an amplifier gets modified by negative feedback? (5)

4. The gain bandwidth product of an op-amp is given as 10MHz. Determine the bandwidth of a non-inverting amplifier using op amp for a gain of 60dB. Also find the closed loop gain of the amplifier if the required bandwidth is 100kHz. (5)

5. Draw the circuit diagram of an ideal differentiator using op-amp with corresponding input and output waveform. Why the circuit can not be recommended for practical use? (5)

6. Design a comparator using Op Amp that compares a sinusoidal signal of 3V peak with a fixed dc voltage of 1.5V. Draw corresponding waveforms. (5)

7. Design a Wein bridge oscillator with frequency of oscillation of 1kHz using op-amp. (5)

8. Draw a monostable multivibrator circuit for a time period of 1msec with an amplitude of 10V using 555 timer. (5)

PART B

Answer any two full questions, each carries 10 marks.

9. a) Explain the construction and operation of Enhancement type MOSFET with neat diagrams. (5)

   b) Design a zener voltage regulator to provide regulated output voltage of 5.6 V for a variable load resistance that varies from 300Ω to 6kΩ. Zener diode parameters are $I_{Z_{min}}=0.25\ mA$ and $P_Z=280\ mW$. The input voltage is considered as constant at 15V. (5)

10. a) The data sheet of N channel JFET gives the following details. $I_{DSS}=10\ mA$ and pinch off voltage of -4.8V. Determine (i) $V_{GS}$ corresponding to drain current of 3.5 mA. (ii) Determine transconductance $g_m$ at this drain current. (5)

    b) Draw the small signal AC equivalent circuit of a Common Drain FET amplifier. Derive the expression for voltage gain, input impedance and output impedance. (5)

11. a) Determine the following parameters for the fixed bias configuration of transistor amplifier. (i) $I_B$ and $I_C$ (ii) $V_{CE}$ and (iii) $V_B$ and $V_C$. Assume $V_{BE}=0.7V$. (4)
Given $\beta=100, V_{cc}=16V, R_c=2.2k\Omega$ and $R_B=240 k\Omega$.

b) Design a voltage divider bias circuit to obtain the following specifications and determine the stability factor. Assume the ratio of base current to the current through $R_B^2$ is 1:10. Given $V_{CC}=22V$, $\beta=100$, $V_{CE}=50\%$ of $V_{CC}$, $V_{RE}=10\%$ of $V_{CC}$, $I_c=0.8mA$ and $V_{BE}=0.7V$.

**PART C**

*Answer any two full questions, each carries 10 marks.*

12 a) Specify different schemes of coupling in multistage amplifiers. Compare their merits and demerits

b) Why class AB power amplifiers are preferred over Class B operations?

13 a) Derive the expression for frequency of oscillation for RC phase shift oscillator using BJT.

b) The datasheet of Op Amp gives the following values.
   Open loop Gain= 175,000, common-mode gain =0.18 and slew rate= 0.5V/µs. Determine the CMRR in decibels. How long does it take the output voltage of an op-amp to go from -10V to +10V?

14 a) Derive the expression for output power and conversion efficiency of class B push pull power amplifier.

b) How do the open-loop voltage gain and closed-loop voltage gain of an op-amp differ? What is the limiting value of output voltage of Op Amp Circuit? Justify with proper characteristics.

**PART D**

*Answer any two full questions, each carries 10 marks.*

15 a) Design an Op Amp circuit to get the output according to the given expression. $V_O=[-0.3V_1+3V_2+V_3]$ where $V_1, V_2$ and $V_3$ are the inputs to op-amp.

b) Analyze the circuit diagram of an Instrumentation amplifier using op-amp. Derive the expression for output voltage.

16 a) Draw and explain the operation of a triangular wave generator using op-amp.

b) Design an astable multi vibrator using 555 timer for an output wave of 60% duty ratio at 2kHz frequency.

17 a) Draw the circuit diagram of a Precision rectifier using op-amp. What is the main advantage over a normal rectifier?

b) Design an RC phase shift oscillator using op-amp for an output frequency of 1kHz

****
PART A

Answer all questions, each carries 5 marks.

1. Draw the circuit of a simple zener voltage regulator and design the value of series resistor $R_S$ for a load voltage of 12V. Given $R_L = 500 \, \Omega$, $I_{z\text{max}} = 80 \, mA$, $I_{z\text{min}} = 10 \, mA$, $V_{inz\text{min}} = 15V$, $V_{inz\text{max}} = 18V$. (5)

2. Draw the frequency response characteristics of RC coupled amplifier and explain the reasons behind its shape. (5)

3. List out the merits and demerits of negative feedback on amplifier performance. (5)

4. Compare the characteristics of ideal Op-Amps and practical Op-Amps. (5)

5. Draw the circuit of an inverting amplifier and obtain the expression for its closed loop gain. (5)

6. Draw the Schmitt trigger circuit and determine the threshold voltages $V_{UT}$ and $V_{LT}$ in a circuit with two resistors $18k\, \Omega$ and $1k\, \Omega$, $V_{\text{ref}} = 4V$, and saturation voltage $= \pm 15V$. (5)

7. With necessary diagrams explain the operation of OP-Amp square wave generator. (5)

8. Explain the operation of Op-Amp crystal oscillator. (5)

PART B

Answer any two full questions, each carries 10 marks.

9. a) Draw and explain the h parameter small signal low frequency model for BJT. (4)
b) Derive the expressions for current gain, input impedance, voltage gain and output impedance using h parameters of BJT. (6)

10. a) Draw and explain small signal model of FET. (4)
b) Obtain the operating point set by the voltage divider bias circuit for an NPN CE transistor with $\beta = 50$ and $V_{BE} = 0.7 \, V$. Given $V_{CC} = 18 \, V$, $R_1 = 82k\, \Omega$, $R_2 = 22k\, \Omega$, $R_C = 5.6k\, \Omega$ and $R_E = 1.2k\, \Omega$. (6)

11. Explain the construction, biasing, operation and characteristics of JFET. (10)
PART C

Answer any two full questions, each carries 10 marks.

12  a) With necessary diagrams explain the working of class A transformer coupled amplifier and obtain the maximum overall efficiency. (8)
    b) What are its advantages and disadvantages (2)

13  a) Compare different types of multistage amplifiers. (5)
    b) With a neat circuit diagram explain the operation of Colpitt’s oscillator using BJT. (5)

14  a) Define the following terms (8)
    i) CMRR  ii) Slew rate  iii) Input bias current  (iv) Input offset voltage
    b) Give the typical values of above parameters for 741 IC (2)

PART D

Answer any two full questions, each carries 10 marks.

15  a) Explain the operation of Op-Amp integrator and differentiator circuits. (6)
    b) Explain the working and design of a triangular wave generator circuit with necessary diagrams. (4)

16  a) What are the features of instrumentation amplifier? Derive the expression for output voltage of an instrumentation amplifier. (6)
    b) Design the feedback circuit of a Wein Bridge oscillator with 2MHz output frequency. (4)

17  With the help of internal circuit diagram of IC555 explain the operation of astable multivibrator. Derive the expression for frequency of oscillation. (10)

****
Reg No.:__________________________   Name:__________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019
Course Code: EE203
Course Name: ANALOG ELECTRONICS CIRCUITS

Max. Marks: 100   Duration: 3 Hours

PART A
Answer all questions, each carries 5 marks.

1. Design a clamper circuit to create a dc offset of -3V to a sine wave input of amplitude 5V also draw the output waveform. (5)

2. Draw the frequency response of CE amplifier and explain why gain falls at very high frequencies & very low frequencies. (5)

3. What is the concept of negative feedback in amplifiers? List out the advantages of negative feedback in amplifiers. (5)

4. Show that the closed loop gain of opamp amplifier can be made independent of its open loop gain. (5)

5. Draw the circuit diagram of a Schmitt trigger. Why it is called as a regenerative comparator? (5)

6. Explain with neat circuit diagram, the operation of Logarithmic amplifier. (5)

7. How triangular wave can be generated using opamps? (5)

8. Determine the output frequency of the 555 astable multivibrator for C=0.01µF, R_A=2kΩ & R_B=200kΩ. (5)

PART B
Answer any two full questions, each carries 10 marks.

9. Design a Voltage divider circuit for a silicon transistor with h_fe=100 and S≤8. The desired Q-point is V_CE=5V, I_C=1mA. Assume V_CC=10V and R_E=1kΩ. (10)

10. Explain using neat sketches, the operation & characteristics of a n-channel JFET. (10)

11. a) Illustrate with neat circuit diagram how the change in base emitter voltage is compensated in transistor amplifiers. (5)

   b) Draw the Hybrid-π model of BJT and explain significance of each parameters. (5)

PART C
Answer any two full questions, each carries 10 marks.

12. Show that the maximum conversion efficiency of class A power amplifier can be increased using transformer coupling. (10)

13. Draw the neat circuit diagram of RC phase shift oscillator and derive its frequency response. (10)
frequency of oscillations

14  a) List out the advantages and disadvantages of a transformer coupled multistage amplifier. (5)

b) How CMRR and Slew rate influence the performance of an opamp? (5)

PART D

Answer any two full questions, each carries 10 marks.

15  With neat circuit diagram, explain the operation of an Instrumentation amplifier and derive an expression for its voltage gain. What are its advantages? (10)

16  Draw the internal circuit diagram of 555 IC and explain its operation as astable multivibrator. (10)

17  a) Explain the working of half wave precision rectifier using neat circuit diagram (5)

b) With neat circuit diagram explain the operation of Wien bridge oscillator using opamp. (5)

****
Course Code: EE205  
Course Name: DC MACHINES AND TRANSFORMERS  
Max. Marks: 100  
Duration: 3 Hours  

Graph sheets shall be provided  

PART A  
Answer all questions, each carries 5 marks.  

<table>
<thead>
<tr>
<th>Marks</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1. Explain the phenomenon of electromechanical energy conversion in the case of a DC generator. What are the torques involved?</td>
</tr>
<tr>
<td>5</td>
<td>2. Derive the expression for generated emf in DC generator.</td>
</tr>
<tr>
<td>5</td>
<td>3. Explain significance of back emf?</td>
</tr>
<tr>
<td>5</td>
<td>4. Explain different methods of cooling of a transformer.</td>
</tr>
<tr>
<td>5</td>
<td>5. Derive the condition for maximum efficiency of a single-phase transformer.</td>
</tr>
<tr>
<td>5</td>
<td>6. What is the difference between commercial efficiency and all day efficiency?</td>
</tr>
<tr>
<td>5</td>
<td>7. What are the necessary conditions to be satisfied for parallel operation of a three phase transformer?</td>
</tr>
<tr>
<td>5</td>
<td>8. What are the advantages and disadvantages of delta-delta connection?</td>
</tr>
</tbody>
</table>

PART B  
Answer any two full questions, each carries 10 marks.  

<table>
<thead>
<tr>
<th>Marks</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>9. a) Explain construction of DC machine with the help of neat diagram</td>
</tr>
<tr>
<td>5</td>
<td>10. a) Equalizer ring is not needed for wave winding of a dc machine. Give reason.</td>
</tr>
<tr>
<td>5</td>
<td>b) An 8 pole lap wound armature having 40 slots with 12 conductors/ slot generates 500V. Determine speed at which machine is running if the flux per pole is 50 mWb.</td>
</tr>
<tr>
<td>10</td>
<td>11. A shunt generator gave the following open circuit characteristics:</td>
</tr>
<tr>
<td></td>
<td>Field current (A)  0.5  1.0  1.5  2.0  2.5  3.0  3.5</td>
</tr>
<tr>
<td></td>
<td>OC emf (V)         54   107  152  185  210  230  245</td>
</tr>
</tbody>
</table>
|       | The armature and field resistances are 0.1Ω and 80Ω respectively. Calculate:
|       | i) The voltage to which the machine will excite when run as a generator at the same speed. |
ii) The voltage lost due to armature reaction when 100A are passing in the armature at terminal voltage of 175V.

iii) The percentage reduction in speed for the machine to fail to excite on open circuit.

**PART C**
*Answer any two full questions, each carries 10 marks.*

12 a) A 460V dc series motor runs at 500 rpm taking a current of 40A. Calculate the speed and percentage change in torque if the load is reduced so that the motor is taking 30A. The total resistance of the armature and field circuits is 0.8Ω. Assume that flux is proportional to the field current. (10)

13 a) Explain different methods of speed control of dc shunt motor. (5) 
   b) Distinguish between core and shell type transformer? (5)

14 a) Draw the phasor diagram of an ideal transformer on no load. Also, draw a phasor diagram of a practical transformer supplying lagging power factor load. (7)
   b) Why transformers are rated in KVA? (3)

**PART D**
*Answer any two full questions, each carries 10 marks.*

15 The test results of 2.5kVA, 230/115V single-phase transformer are as follows: (10)
   OC Test : 115V, 1.2A, 60W
   SC Test : 12V, 10.86A, 120W
   Find i. efficiency at 50% full load, 0.8 pf
   ii. regulation at 30% full load, 0.8 pf lag and lead

16 a) Derive an expression for the saving of copper in an autotransformer as compared to an equivalent two winding transformer. (5)
   b) Explain the working of off-load tap changing transformer with help of neat diagram. (5)

17 a) Draw the connection diagram for T-T connection of transformers and explain the formation of three-phase four wire system with two single phase transformers. Point out its advantages and disadvantages. (10)

****
Reg No.:_________________________ Name:_________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: EE205
Course Name: DC MACHINES AND TRANSFORMERS

Max. Marks: 100 Duration: 3 Hours

**PART A**

*Answer all questions, each carries 5 marks.*

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Name the parts of dc machine and state the functions of any two parts.</td>
<td>(5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Derive the emf equation of dc generator.</td>
<td>(5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>With the help of speed-armature current characteristics, explain why the series motors should not be started without any load.</td>
<td>(5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Why the rating of transformer in kVA?</td>
<td>(5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>List out the necessary and desirable conditions for parallel operation of two single phase transformers.</td>
<td>(5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Define all day efficiency. How this efficiency of a transformer varies with load?</td>
<td>(5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>A 10 kVA, 1500/150 V, single phase transformer has following parameters: HV side: ( r_1 = 4.2 \Omega ) ( x_1 = 5.1 \Omega ) LV side: ( r_2 = 0.05 \Omega ) ( x_2 = 0.062 \Omega ) Find the per unit values of equivalent resistance and inductive reactance.</td>
<td>(5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>What is the purpose of tertiary winding in three winding transformer?</td>
<td>(5)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PART B**

*Answer any two full questions, each carries 10 marks.*

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9 a)</td>
<td>Draw the winding diagram of a dc machine with 4 poles, 12 slots progressive double layer lap winding.</td>
<td>(7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 b)</td>
<td>Name the different losses occur in dc machine. How the magnetic losses are minimized in dc machine?</td>
<td>(3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 a)</td>
<td>A 4 pole wave connected armature of a dc generator has 120 conductors and runs at 1200 rpm. If the flux per pole is 0.015 Wb, find the emf generated. Keeping the flux constant, suggest a change in the armature of the generator so that the generator is capable to generate half of the no load voltage when running at the same speed.</td>
<td>(7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 b)</td>
<td>What is self excitation? What are the conditions for building up of voltage in dc shunt generator?</td>
<td>(3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 a)</td>
<td>A 10 KW shunt generator having resistances 1Ω and 100Ω, delivers full load at a</td>
<td>(7)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
terminal voltage of 230 V. Determine the efficiency of the generator at full load, assuming the iron, friction and windage losses amount to 500 W.

b) Write any three differences between wave winding and lap winding. (3)

---

**PART C**

*Answer any two full questions, each carries 10 marks.*

12 What is the necessity of a starter for motor? With a suitable diagram, explain the working of 3 point starter. (10)

13 a With suitable diagram, how the Swinburne’s test can be employed to predetermine the efficiency at full load condition when running as a generator (6)

   b Differentiate between core type and shell type transformers. (4)

14 Explain the working of a transformer on no-load and load condition. (10)

---

**PART D**

*Answer any two full questions, each carries 10 marks.*

15 a) Derive the condition for maximum efficiency of transformer. How the efficiency of a transformer depends on load? (5)

   b) Why the star delta three phase transformer is used to step down the voltage in transmission system (5)

16 A 600W single phase transformer working at unity power factor has an efficiency of 95 percent at both half full load and full load. Determine the efficiency at 70 percent of full load. (10)

17 With neat circuit diagram, explain how a two phase supply can be obtained from a three phase supply. Prove that three phase currents will be balanced, for a balanced upf load on 2-phase side. (10)

****
PART A

Answer all questions, each carries 5 marks.

1. The armature of a 250 V, 10kW, 4 pole lap connected generator was reconnected in wave. Find the new voltage, current and power ratings. (5)

2. Derive the E M F equation of a DC generator. (5)

3. Why a starter is required to start a DC motor? What is the essential element of a starter? (5)

4. Draw the phasor diagram of a transformer on no load. Show the two components of the no load current and write their names. (5)

5. What is meant by negative voltage regulation? For what type of load you may get negative voltage regulation? (5)

6. A 1000/800V, 8kVA autotransformer supplies rated current to a load on low voltage side. Draw a schematic diagram and mark input current, output current and current in the section of the winding common to high voltage and low voltage sides. (5)

7. Find the rated line currents on high voltage and low voltage sides of a 500kVA 11kV/400V delta-star transformer. (5)

8. What is meant by vector group? What is Yd1 vector group? (5)

PART B

Answer any two full questions, each carries 10 marks.

9. Draw the developed view of a double layer lap winding of a 4 pole 12 slot armature. Commutator and brushes need not be drawn. (10)

10. Draw the developed view of mmf and flux distribution of a loaded 2 pole machine. (10)

11. The table shows OCC of a dc shunt generator at a speed 1000 rpm. What is the residual voltage? Find the critical resistance. Also find the maximum voltage build up at 1000 rpm and critical speed for a field resistance of 300 Ω. (You can find the answers by carefully observing the table. If necessary you may draw a rough sketch. Graph sheet is not required)

<table>
<thead>
<tr>
<th>If</th>
<th>0</th>
<th>0.1</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
<th>0.8</th>
<th>0.9</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>10</td>
<td>50</td>
<td>100</td>
<td>150</td>
<td>190</td>
<td>220</td>
<td>245</td>
<td>260</td>
<td>275</td>
<td>285</td>
<td>300</td>
</tr>
</tbody>
</table>

PART C

Answer any two full questions, each carries 10 marks.

12. A 250 V shunt motor has resistances 0.2 Ω and 250 Ω. The motor is driving a
constant load torque and running at 1000 rpm drawing 10 A current from the
supply. Calculate the new speed and armature current if an external armature
resistance of value 10 Ω is inserted in the armature circuit. Also find the
stalling current. Neglect armature reaction and saturation.

13  a) During Swinburne’s test a 250V DC machine was drawing 3A from the 250V
supply. The resistances are 250 Ω and 0.2 Ω. Find the constant loss of the
machine. Also find the efficiency of the machine when it is delivering a 20A at
250V.  
   b) Why transformers are rated in kVA not in KW?

14  Develop the equivalent circuit of a transformer.

PART D
Answer any two full questions, each carries 10 marks.

15  Two standard tests were conducted on a 10kVA, 1000/200V transformer.
Current in one test was 2A. Voltage in one test was 15V. Power factors were
0.8 and 0.2. Find the efficiency at 90% full load and 0.8 power factor.

16  a) What are the necessary and desirable conditions for successful parallel
operation of two single phase transformers?
   b) Can a Yd transformer be operated in parallel with a Dy transformer? What
additional condition is to be satisfied over and above the conditions listed in
question 16 a).

17  In Scott connection prove that the 3-phase currents will be balanced if the 2-
phase currents are balanced. Assume upf load.

****
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018
Course Code: EE205
Course Name: DC MACHINES AND TRANSFORMERS (EE)

Max. Marks: 100
Duration: 3 Hours

PART A

1. Point out the necessity of equalizer rings in a lap wound dc machine. Why this is not applicable in wave wound machines. (5)

2. What is armature reaction and how it is eliminated in DC machines. (5)

3. Compare the electrical and mechanical characteristics of a DC shunt motor with those of a DC series motor. Based on this point out the application areas of these motors. (5)

4. What is the principle of operation of a transformer? Show how the flux is balanced when the transformer is supplying a load. (5)

5. With supporting phasor diagrams, derive the expression for secondary side voltage regulation of a transformer for lagging and leading power factor loads. (5)

6. What are the necessary and desirable conditions to be satisfied for parallel operation of two single phase transformers? (5)

7. Distinguish the vector groupings Yy0, Dd0, Dy1, Yd11 in three phase transformer connections. (5)

8. Show how three phase power is obtained by using two single phase transformers connected in open delta. (5)

PART B

1. For a 6 pole DC armature with 16 slots having two coil sides per slot and single turn coils, calculate the relevant pitches for a wave winding and draw the developed winding diagram. (10)

2. Draw the magnetisation characteristics of a DC shunt machine. Point out the conditions for voltage build-up of a DC shunt generator. Give the significance of the terms critical resistance and critical speed as applicable to a DC shunt generator. (10)

3. A short shunt compound DC generator supplies a current of 100A at 220V. If the resistance of the shunt field is 50 Ω, of the series field is 0.02 Ω, of the armature is 0.05 Ω, the iron and friction losses amount to 1KW. Find:
   i) The generated emf
   ii) The copper losses
   iii) Output power of the prime-mover driving the generator
   iv) The generator efficiency. (10)
PART C

Answer any two full questions, each carries 10 marks

12 With a neat sketch, explain the working of three-point starter. What is its main drawback? How this is eliminated in four point starters? (10)

13 a) With supporting diagrams, show how the retardation test can be employed to find out the various losses occurring in a DC machine. (6)
   b) Explain the working principle of 1ϕ transformers. (4)

14 Readings from O.C and S.C test on a 8kVA, 400/200V, 50Hz transformer are (10)
   OC Test : 200V, 2A, 80W ;meters on low voltage side
   SC Test : 10V, 20A, 120W; meters on high voltage side
   Compute equivalent circuit of the transformer as referred to high voltage side.

PART D

Answer any two full questions, each carries 10 marks

15 a) Derive the condition for maximum efficiency for a transformer. (5)
   b) Distinguish between auto transformers and two winding transformers. Derive the expression for saving in copper in an auto transformer. (5)

16 a) Derive the condition to be satisfied for zero voltage regulation and maximum voltage regulation for a transformer. (4)
   b) With neat circuit diagram, explain how a two-phase supply can be obtained from a three-phase supply. (6)

17 Draw the connection diagram for T-T connection of transformers and explain the formation of three phase four wire system with two single phase transformers. Point out its advantages and disadvantages. (10)
PART A

Answer all questions, each carries 5 marks

1. Point out the necessity of equalizer rings in a lap wound dc machine. Why this is not applicable in wave wound machines. (5)

2. What is armature reaction and how it is eliminated in DC machines. (5)

3. Compare the electrical and mechanical characteristics of a DC shunt motor with those of a DC series motor. Based on this point out the application areas of these motors. (5)

4. What is the principle of operation of a transformer? Show how the flux is balanced when the transformer is supplying a load. (5)

5. With supporting phasor diagrams, derive the expression for secondary side voltage regulation of a transformer for lagging and leading power factor loads. (5)

6. What are the necessary and desirable conditions to be satisfied for parallel operation of two single phase transformers? (5)

7. Distinguish the vector groupings Yy0, Dd0, Dy1, Yd11 in three phase transformer connections. (5)

8. Show how three phase power is obtained by using two single phase transformers connected in open delta. (5)

PART B

Answer any two full questions, each carries 10 marks

9. For a 6 pole DC armature with 16 slots having two coil sides per slot and single turn coils, calculate the relevant pitches for a wave winding and draw the developed winding diagram. (10)

10. Draw the magnetisation characteristics of a DC shunt machine. Point out the conditions for voltage build-up of a DC shunt generator. Give the significance of the terms critical resistance and critical speed as applicable to a DC shunt generator. (10)

11. A short shunt compound DC generator supplies a current of 100A at 220V. If the resistance of the shunt field is 50 Ω, of the series field is 0.02 Ω, of the armature is 0.05 Ω, the iron and friction losses amount to 1KW. Find:
   i) The generated emf
   ii) The copper losses
   iii) Output power of the prime-mover driving the generator
   iv) The generator efficiency. (10)
PART C

Answer any two full questions, each carries 10 marks

12  With a neat sketch, explain the working of three-point starter. What is its main drawback? How this is eliminated in four point starters?  

13  a)  With supporting diagrams, show how the retardation test can be employed to find out the various losses occurring in a DC machine.  

    b)  Explain the working principle of 1ϕ transformers. 

14  Readings from O.C and S.C test on a 8kVA, 400/200V, 50Hz transformer are 

    OC Test : 200V, 2A, 80W ;meters on low voltage side 
    SC Test : 10V, 20A, 120W; meters on high voltage side 

    Compute equivalent circuit of the transformer as referred to high voltage side. 

PART D

Answer any two full questions, each carries 10 marks

15  a)  Derive the condition for maximum efficiency for a transformer.  

    b)  Distinguish between auto transformers and two winding transformers. Derive the expression for saving in copper in an auto transformer. 

16  a)  Derive the condition to be satisfied for zero voltage regulation and maximum voltage regulation for a transformer. 

    b)  With neat circuit diagram, explain how a two-phase supply can be obtained from a three-phase supply. 

17  Draw the connection diagram for T-T connection of transformers and explain the formation of three phase four wire system with two single phase transformers. 

    Point out its advantages and disadvantages
PART A

(Append all questions, each question carries 5 marks)

1. Explain the working of a DC motor. What is the significance of back e.m.f in DC motors?
2. What is armature reaction in dc machines? How it affects the main flux distribution and how can armature reaction be reduced?
3. Draw the phasor diagram of a practical transformer on load at (a) lagging p.f (b) leading p.f (c) u.p.f.
   Also draw the phasor diagram of an ideal transformer at no load.
4. Define the terms critical resistance and critical speed and bring out their roles in the process of self excitation in dc machines. What are the conditions for voltage build up in a DC shunt generator?
5. A 4 kVA, 400/200 V single phase transformer has resistance of 0.02 p.u and reactance of 0.06 p.u. What is the value of its resistance and reactance referred to h.v side?
6. What are the necessary and desirable conditions for parallel operation of transformers?
7. Explain the principle of operation of a transformer. Derive the emf equation of a single phase transformer.
8. What are the different connections of three phase transformers?

PART B

(Append any 2 questions, each question carries 10 marks)

9. Give the constructional features and working principle of a DC generator. Draw the cross-sectional view of a 4 pole DC generator and label all the parts. Explain the function of each part.
10. Explain the different methods of excitation of DC generators with suitable diagrams.
11. A short shunt compound generator has armature, series field & shunt field resistances of 0.06Ω, 0.03Ω and 110Ω respectively. It supplies 100 lamps rated at 250V, 40W. Find the generated e.mf. Assume that contact drop per brush = 1V.

PART C

(Answer any 2 questions, each question carries 10 marks)

12. Why is a starter necessary for a motor? Give the diagram and explain the working of a three- point starter for a shunt motor including the features of no volt release’ and ‘overload release’.

13. A 200V series motor has a total resistance of 0.5Ω. It runs at 800 rpm taking an input current of 10A. Find the series resistance required to reduce the speed to 600 rpm, the input current being kept constant.

14. A transformer on no load has a core loss of 50W, draws a current of 2A (rms) and has an induced emf of 230V (rms). Determine the no load power factor, core loss current and magnetizing current. Also calculate the no load circuit parameters of the transformer. Neglect winding resistances & leakage flux.

PART D

(Answer any 2 questions, each question carries 10 marks)

15. Explain sumner’s method of testing transformers. What are its advantages over OC and SC tests?

16. Explain the operation of an autotransformer. How saving of copper is achieved in an autotransformer as compared to an ordinary two winding transformer. What are the advantages of autotransformer over conventional two winding transformer?

17. The efficiency of 100kVA, 110V/220V, 50Hz single phase transformer is 98.5% at half full load and 0.8 pf lead and 98.8% at full load upf, find (a) Iron loss (b) Full load copper loss (c) maximum efficiency at upf.
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: EE201
Course Name: CIRCUITS AND NETWORKS

Max. Marks: 100
Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

1. Find the current flowing through the 5Ω resistor shown in figure 1 if all active elements are ideal. (5)

2. Sketch the network graph if the incidence matrix is as represented below: (5)

3. A resistance R and 5µF capacitor are connected in series across a 100V dc supply. Calculate the value of R such that the voltage across the capacitor becomes 50V in 5s after the circuit is switched on. (5)

4. In an RL series circuit, R=5 Ω, L=2.5mH and i(0-)=2A. If a source of 50V is applied at t=0, find i(t) for t>0, using Laplace transformation. (5)

5. For the network shown in figure 2, determine the transfer function Z_{21}(s) and the driving point admittance function Y_{11}(s). (5)
6 Derive the expression of $z$-parameters in terms of $y$-parameters. (5)
7 Explain the differences between Cauer form and Foster form. (5)
8 Check whether the polynomial $s^4 + 6s^3 + 2s^2 + s + 1$ is Hurwitz or not. (5)

PART B
Answer any two full questions, each carries 10 marks.

9 Use superposition theorem to find the current, I in the circuit shown in fig. 3 (10)

10 For the network shown in figure 4, draw the network graph. Select 2, 4, 5 as tree branches. Obtain tie-set matrix and hence find the loop currents. (10)
PART C

Answer any two full questions, each carries 10 marks.

12 a) A series RC circuit with $R=10\Omega$ and $C=4\mu F$ has an initial charge $Q_0=800\mu C$ on the capacitor. At $t=0$, the switch is closed to apply a constant dc voltage source of 100V. Sketch the transformed circuit. Find the resulting current transient if the charge on the capacitor has the same polarity as deposited by the source.

13 a) In the network shown in figure 6, the switch is opened at $t=0$. Find out the current through the $1\Omega$ resistor after opening the switch.

14 a) In the RL circuit shown in figure 7, the switch is in position 1 long enough to establish steady state conditions and at $t=0$, it is switched to position 2. Find the resulting current.
PART D

Answer any two full questions, each carries 10 marks.

15  a) Find the Z and Y parameters of the given π-network.

Fig. 8

16  Find the first and second order Cauer forms of the function, \( z(s) = \frac{2s^2 + 8s + 6}{s^2 + 2s} \) (10)

17  Find the two canonical Foster networks with elements for the impedance function, \( Z(s) = \frac{(s + 1)(s + 3)}{s(s + 2)} \) (10)

****
PART A

(Answer all questions. 5 Marks for each question)

1. Using Superposition theorem, determine voltage $V_2$ for the circuit shown.

![Circuit Diagram](image)

2. Obtain basic cutset matrix for the network graph shown in figure and write down the network equations. Take 1,2,3 as tree branches.

![Network Graph](image)

3. What is the difference between transient analysis and steady state analysis of electrical network. Explain with suitable example.

4. Write the mesh equations in s-domain for the network of figure, when a 10 V source is switched on. The primary and secondary self inductances are $L_1 = L_2 = 1$ H and $M = 0.5$ H
5. The port currents of a two port network are given by

\[ I_1 = 2.5 \ V_1 - V_2 \]
\[ I_2 = -V_1 + 5 \ V_2 \]

Find the equivalent \pi network.

6. Explain the symmetry and reciprocity property of a two port network. State the conditions for them in terms of different parameters.

7. Explain the properties of a positive real function.

8. Describe the procedure of synthesizing the positive real function in First Cauer form of LC network.

---

**PART B**

*(Answer any two Questions. 10 Marks for each question)*

9. Use Thevenin’s theorem to find the voltage across 3 \ \Omega resistor in figure.
10. For the circuit shown, determine the load current $I_L$ by using Norton's theorem.

![Circuit Diagram]

11. Calculate the loop currents using graph theory.

![Circuit Diagram]

**PART C**

*(Answer any two questions. 10 Marks for each question)*

12. Find the response $i(t)$ in a series RLC circuit when a step input of $V$ volts is applied across it at time $t = 0$. Assume all initial conditions as zero.

13. In the given circuit, capacitor $C$ has an initial voltage $v_C(0^-) = 10$ volts and at the same instant, current in the inductor is zero. Switch $k$ is closed at time $t = 0$. Obtain an expression for voltage across the inductor $L$. 
14. An RL series circuit is excited by sinusoidal voltage \( v(t) = V_m \sin (wt + \Phi) \). Derive an expression for the current in the circuit. Discuss the factors which govern the maximum value and rate of decay of transient component of current.

**PART D**

*Answer any two questions. 10 Marks for each question*

15. a) What are transmission parameters?

b) Show that the overall transmission parameter matrix for cascaded 2 port network is simply the matrix product of transmission parameters for each individual 2 port network in cascade.

c) Find the second Foster form of LC network represented by

\[
Y(s) = \frac{5s^2 + 1}{s(2s^2 + 1)}
\]

16. Find the \( Z \) and \( Y \) parameters for the network shown in figure.

17. a) Differentiate between network analysis and synthesis.

b) Realize the given impedance function \( Z(s) \) as a First Foster form

\[
Z(s) = \frac{s^2 + 4s + 3}{s^2 + 6s + 8}
\]
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: EE201
Course Name: CIRCUITS AND NETWORKS (EE)

Max. Marks: 100
Duration: 3 Hours

PART A
Answer all questions, each carries 5 marks

1. Stat and explain reciprocity theorem. (5)

2. Write down the properties of incidence matrix. (5)

3. If an RLC series circuit is energised by a 10V DC source at t=0 sec. Draw the expected graph of the following circuit variables under different damping conditions:
   i) The current through the circuit    ii) Voltage across the capacitor. (5)

4. Find the current through circuit shown in Fig. 1. (5)

5. Derive the condition for symmetry and reciprocity of Y-parameters. (5)

6. What is h-parameters? Why they are called hybrid parameters? (5)

7. What is the differentiate between network analysis and synthesis. (5)

8. State the properties of LC driving point immittance function. (5)

PART B
Answer any two full questions, each carries 10 marks

9. For the circuit shown in Fig. 2 find the value of $R_L$ that absorbs maximum power from the circuit and the corresponding power under this condition. (10)

10. For the network shown in Fig. 3, draw the oriented graph, write the tie-set schedule and hence obtain the equilibrium equations on loop basis. Calculate the values of branch current and branch voltages. (10)
Figure 2

11  (a) Draw the Norton’s equivalent circuit and Thevenin’s equivalent circuit of Fig. 4. (5)

(b) Obtain basic cutset matrix for the oriented graph shown in Fig. 5. Take 1,2,3 as twigs. (5)

PART C

Answer any two full questions, each carries 10 marks

12  For the circuit shown in Fig. 6, the DPDT switch at position 2 for a long time. (10)

At t=0 sec. contact is moved from position 2 to 1 and at t= 10 sec. the contact is moved from 1 to 2. Derive a expression for the $i_C(t)$ and $v_C(t)$ in both cases. Plot variation of $i_C(t)$ and $v_C(t)$. 

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6
Find the expression for the current through the inductor \( i_L(t) \) in a parallel RLC (three branch) circuit when a step input of 1 ampere is applied across it at time \( t = 0 \). Assume all initial conditions are zero. Apply Laplace transform technique.

The switch S in the circuit of Fig. 7 is in the closed position for long time. At \( t=0 \), the switch opens. Find the expression for the current using Laplace transform.

**PART D**

*Answer any two full questions, each carries 10 marks*

15. Obtain the z parameters for the network in Fig. 8 as functions of \( s \).

16. a) The Z-parameters of a two port network are \( Z_{11} = 10\Omega \), \( Z_{22} = 15\Omega \), \( Z_{12} = Z_{21} = 5\Omega \). Find the equivalent T-network and ABCD parameters.

   b) Test whether the polynomial \( P(s) = s^4 + s^3 + 3s^2 + 2s + 12 \) is Hurwitz.

17. a) Point out the difference in the philosophy between Foster and Cauer form of synthesis of a given driving point impedance.

   b) The driving point impedance of a circuit is

   \[
   Z(s) = \frac{2(s^2 + 1)(s^2 + 3)}{s(s^2 + 2)}
   \]

   Realize the given impedance function \( Z(s) \) as a Cauer’s first form.

   ****
PART A

Answer all questions, each carries 5 marks.

1. Explain reciprocity theorem. Verify reciprocity theorem for the network shown in fig.(1).

2. Express KVL equations for any circuit using the fundamental tie set matrix.

3. The series RL circuit in fig. (2) is connected to 100V source at \( t=0 \). Determine the expression for the current \( i(t) \) in the circuit.

4. Explain how the conductively coupled equivalent circuit of a given magnetically coupled circuit can be derived.

5. Find the equivalent network when two port networks are connected in parallel.

6. What are \( T \) parameters? Express \( T \) parameters in terms of \( Y \) parameters.

7. Write down the properties of the driving point impedance function of RL networks.

8. What are positive real functions? What are the necessary conditions to be satisfied by a driving point function to be positive real?

PART B

Answer any two full questions, each carries 10 marks.

9. a) Determine the value of \( Z_L \) in the circuit shown in fig.(3) so that the power delivered to the load(\( Z_L \)) is maximum.
b) Determine the current supplied by the 100V source shown in fig.(4) using Thevenin’s theorem.

Fig(4)

10 a) Find the Norton’s equivalent network across terminals AB for the circuit shown in fig. (5)

Fig(5)

b) Explain node pair analysis as referred to topological analysis of electrical networks.

Find the power delivered by the current sources in the given network shown in fig. (6) using node analysis by graphical method.

Fig(6)

PART C

Answer any two full questions, each carries 10 marks.

12 A series RLC circuit consists of a resistance 20 Ω, inductance 0.05H and capacitance 20μF in series with a 100 V constant voltage source when the switch is closed at t=0. Find the expression for the current in the circuit. Also find the current at t=3ms.

13 In the given circuit shown in fig.(7), the switch is closed to position 1 at t=0 and after a time equal to one time constant it is moved to position 2. Find the expression for current after moving to position 2. Assume zero initial charge on the capacitor. (Use Laplace transform technique)
Find the voltage across the 5Ω resistor in the circuit shown in fig. (8). (10)

**PART D**

*Answer any two full questions, each carries 10 marks.*

15 a) The ABCD parameters of a two port network are \( A=3, \ B=160, \ C=0.05, \ D=3. \) Find the equivalent \( T \) and \( \pi \) network. (5)

b) Check whether the given polynomial \( P(s) = s^3 + 3s^2 + 6s + 18 \) is Hurwitz or not. (5)

16 The driving point impedance of a network is given by
\[
Z(s) = \frac{2(s^2+4s+3)}{(s+2)(s+6)}
\]
Obtain the first Foster form and second Cauer form of the network. (10)

17 Obtain the Foster I and II forms of a network whose driving point function is given as
\[
Z(s) = \frac{4s(s^2+4)}{(s^4+17s^2+16)}
\]
****
PART A

Answer all questions, each carries 5 marks.

1. State and prove Maximum Power Transfer theorem as applied to ac circuits having variable load impedance.

2. For the network shown in Fig. 1 draw the oriented graph and write the (i) Incidence Matrix (ii) Tie set Matrix

![Network Diagram](image)

Fig. 1

3. In a series RLC circuit with \( R = 4\Omega \), \( L = 1\text{H} \) and \( C = 0.25\text{F} \), a unit step voltage is applied at \( t = 0 \). Find the expression for the current in the circuit at \( t > 0 \).

4. The current through a 1\(\Omega\) resistor in a circuit is given by the following s domain equation \( I(s) = \frac{s+2}{s^2+2s+2} \). Find the voltage across the resistor.

5. List the necessary conditions for a driving point function.

6. What are h-parameters? Draw the equivalent circuit of a two port network with h-parameter representation.

7. Test whether the polynomial \( F(s) = s^5 + 3s^3 + 2s \) is Hurwitz.

8. Determine whether the following functions represent driving point impedance of an RC network.

   (i) \( Z_1(s) = \frac{s^2 + 5s + 4}{s^2 + 2s} \)

   (ii) \( Z_2(s) = \frac{2s^2 + 8s + 6}{s^2 + 8s + 12} \)

PART B

Answer any two full questions, each carries 10 marks.

9. Find the Norton’s equivalent circuit across a-b for the network shown in Fig. 2.

   (10)
10 a) Find current, ‘\(i\)’ in the network shown in Fig.3 using super position theorem

Fig.3

b) List the properties of Incidence Matrix

11 For the network shown in Fig.4 write down the tieset matrix and obtain the network equilibrium equations in matrix form using KVL. Calculate the loop currents.

Fig.4

**PART C**

**Answer any two full questions, each carries 10 marks.**

12 The switch in the circuit of Fig.5 is moved from position 1 to position 2 at \(t = 0\). Determine \(v_c(t)\).

Fig.5
13 In the network shown in Fig. 6 the switch is opened at t = 0. Find \( i(t) \) \( \text{(10)} \)

![Fig.6](image)

14 Figure 7 shows a network with mutual coupling. Find the current in the 10Ω resistance. Assume that inductors have negligible resistance.

![Fig.7](image)

**PART D**

*Answer any two full questions, each carries 10 marks.*

15 a) Derive the condition for reciprocity and symmetry of \( Z \) parameters \( \text{(5)} \)

b) Find the transmission parameters for the network shown in Fig. 8 \( \text{(5)} \)

![Fig.8](image)

16 a) Show that the overall admittance parameter matrix for parallel connected two-port network is the sum of admittance parameters of each individual two-port network in parallel \( \text{(5)} \)

b) Synthesize the network function \( Z(s) = \frac{(s^2 + 1)}{s(s^2 + 2)} \) in Foster I form. \( \text{(5)} \)

17 Find the Cauer I and II forms of the RL impedance function \( Z(s) = \frac{2(s+1)(s+3)}{(s+2)(s+6)} \) \( \text{(10)} \)

****
PART A

Answer all questions. Each question carries 5 marks.

1. Apply Superposition theorem to determine the current I in the circuit shown in figure (1).

2. For the graph shown in figure (2), select \{4, 5, 6\} as tree and hence determine the fundamental cut-set matrix Q and tie-set matrix B. Also prove that Q and B are orthogonal.

3. In the circuit shown in figure (1), steady state exists when switch is in position 1. At \( t = 0 \), it is moved to position 2. Determine the expression for current \( i(t) \) through the inductance for \( t \geq 0 \).

4. The current through a 4F capacitance is given by the following s-domain equation

\[
I(s) = \frac{24(s + 2)}{(s + 1)(s + 3)}
\]

Find voltage across the capacitance \( v(t) \).

5. Determine the h-parameters of the network shown in figure (4) and hence check whether the network is symmetrical.
6. If \([z] = \begin{bmatrix} 3 & 2 \\ 2 & 3 \end{bmatrix}\) for the two port network shown in figure (5), calculate the average power delivered to 1Ω resistor. \(\text{(5)}\)

7. Test whether the polynomial \(F(s) = s^4 + 3s^3 + 4s^2 + 3s + 1\) is Hurwitz. \(\text{(5)}\)

8. Test whether the following represents LC driving point immittance function
\[
F(s) = \frac{3(s^2 + 1)(s^2 + 9)}{s(s^2 + 3)}.
\]
\(\text{(5)}\)

**PART B**

**Answer any two questions. Each question carries 10 marks.**

9. Determine Norton equivalent circuit for the network shown in figure (6) and hence find the current \(I_L\) through 5Ω resistor.

10. In the network shown in figure (7), determine the value of \(R_L\) for maximum power transfer. Also, find the maximum power transferred.
11. Draw the oriented graph, select a suitable tree and find the tie-set matrix for the circuit shown in figure (9). Hence find the currents $I_1$, $I_2$ and $I_3$ using mesh analysis.

![Figure (9)](image)

**PART C**

*Answer any two questions. Each question carries 10 marks.*

12. In the circuit shown in figure (10), the switch is opened at $t = 0$, steady state conditions having been established earlier to the switching operation. Find the current $i_L(t)$ for $t \geq 0$.

![Figure (10)](image)

13. In the circuit shown in figure (11), draw the transformed circuit and determine the current $i_2(t)$ using mesh analysis. Assume the initial conditions as zeros.

![Figure (11)](image)

14. In the circuit shown in figure (12), the switch is closed at $t = 0$. Determine the voltage $v_o(t)$ for $t \geq 0$. 

![Figure (12)](image)
PART D

*Answer any two questions. Each question carries 10 marks.*

15. For the network shown in figure (13), find a) z-parameters and b) ABCD parameters.

16. For the network shown in figure (14), determine driving point admittance $Y_{11}(s)$ at port 1 and transfer admittance $Y_{12}(s) = \frac{I_2(s)}{V_1(s)}$.

17. Determine Foster I and II realizations of the driving point LC impedance function

$$Z(s) = \frac{4(s^2 + 1)(s^2 + 16)}{s(s^2 + 4)}.$$
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION (R&S), DECEMBER 2019

Course Code: HS200
Course Name: BUSINESS ECONOMICS

Max. Marks: 100
Duration: 3 Hours

PART A

Answer any three questions, each carries 10 marks.

1 a) What is the relevance of Business Economics in modern business? (5)
   b) Why does the problem of choice arise in an economy? (3)
   c) What is opportunity cost? (2)

2 a) State the law of diminishing marginal utility. What are its assumptions? (5)
   b) Briefly explain any three factors determining demand of a product. (3)
   c) What is an inferior good? (2)

3 a) How is market price of a commodity determined? Suppose there is a change in fashion favourable to a commodity. What happens to its equilibrium price and quantity, if there is no change in supply conditions? Draw a diagram and explain. (6)
   b) Suppose a consumer purchased 50 units of a commodity when his monthly income was Rs.15000/-. When his income increased to Rs.20000/- he purchased 40 units of this commodity. Estimate income elasticity of demand? What type of a commodity is this? (4)

4 a) What is a production function? Explain Cobb-Douglas production function. (6)
   b) A firm's production function is given as Q = 2 L^{1/2} K^{1/2}. What will be the output when L=25 and K=9? Suppose the firm increases the number of units of capital to 16 and they want to produce 80 units of output. What should be the number of units of labour? (4)

PART B

Answer any three questions, each carries 10 marks.

5 a) What is MC? In short run changes in MC depends on the changes in TVC. Why? (5)
   b) Suppose the AC of a firm is greater than price and price is greater than AVC. Will the firm produce or shut down? Give reason. (3)
   c) Suppose contribution per unit of output sold is Rs.10 and TFC is Rs.10000. What is the break-even output? If actual sales is 1200 units estimate margin of safety. (2)

6 a) Explain any 4 features of monopoly? Make a comparison between the demand
curves under monopoly and monopolistic competition.

b) What is a kinked demand curve? (4)

7 a) Suppose the gross value of output at market price of a firm is Rs.50000. If the annual depreciation is Rs.2000 and indirect tax is Rs.500, estimate net value of output at market price and at factor cost. Also estimate the net value added at factor cost if the firm used intermediate goods for Rs.7500.

b) Explain the circular flow in a simple two sector model (4)

8 a) Draw diagrams and explain demand pull and cost push inflation (6)

b) What are the four phases of a business cycles? (4)

PART C

Answer any four questions, each carries 10 marks.

9 a) The initial investment on a project is Rs.50000 and the cost of borrowing is 10%. If the cash flows after tax from year 1 to 3 are Rs.40000, 30000 and 20000 respectively. Estimate BCR or profitability index.

b) Give any two merits and demerits of BCR method (4)

10 a) What is payback method? What are its merits and demerits? (6)

b) How is decision taken under a situation of risk? (4)

11 a) What is savage principle? A payoff matrix is given below. Which alternative will be selected according to the savage principle or minimax regret? (estimate regrets)

<table>
<thead>
<tr>
<th>Possible future demand</th>
<th>Alternative</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small facility</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Medium facility</td>
<td>19</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Large facility</td>
<td>13</td>
<td>14</td>
<td>24</td>
</tr>
</tbody>
</table>

12 a) Explain assets and liabilities in a balance sheet? Give 2 examples each (6)

b) What are the uses and limitations of a balance sheet? (4)

13 a) Forecast the sales for the year 2018 for the time series data given below by least square method.

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales(in lakhs)</td>
<td>50</td>
<td>70</td>
<td>60</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

14 a) Distinguish between foreign direct investment and foreign portfolio investment. (6)

b) Give any four advantages and disadvantages of direct tax (4)
PART A
Answer any three questions, each carries 10 marks. 

1 a) How does Business Economics help a business man?  
   b) What are the three central problems of an economy?  
   c) How is Economics defined in terms of scarcity of resources?  

2 a) Draw a total utility curve and marginal utility curve and derive three relations between MU and TU.  
   b) Explain the law of demand with the help of a demand schedule.  
   c) Give any two exceptions of law of demand.  

3 a) How is equilibrium price of a commodity determined? Suppose cost of production of a commodity increases. How does it affect supply as well as equilibrium price? Substantiate your answer with a diagram.  
   b) Suppose 50 units of commodity X was demanded when its price was Rs.10 per unit. Later its demand decreased to 40 units without any change in its price. It has been found that the price of a similar product Y decreased from Rs.10 to 8. Estimate cross elasticity of demand between the products X and Y.  

4 a) State the law of variable proportions. Explain the law with the help of a diagram.  
   b) i) A production function is given as Q = 3 L^{1/4} K^{3/4}. This is a linearly homogeneous production function. Why? ii) If L=16 and K=6, what will be the output?  

PART B
Answer any three questions, each carries 10 marks. 

5 a) Distinguish between TFC and TVC. Draw TFC and TVC and TC curves  
   b) Suppose the average cost of a product is Rs.20 and average variable cost is Rs.15. If price of the product is Rs.18, will the firm continue its production in the short run or shutdown? Give reason.  
   c) Suppose P.V ratio is 0.2 and fixed cost is Rs.10000. What is the break-even sales? If the price per unit is Rs.50 what is the break-even level of output?  

6 a) Make a comparison between perfect competition and monopolistic competition.  
   b) What is collusive oligopoly?
7 a) Estimate GDPmp and GNPfc from the following data (given in crores) according to the expenditure method. Private final consumption expenditure (C) = 6000, Investment (I) = 4000, Government consumption expenditure (G) = 1400, Net-exports (X-M) = 600, Net indirect tax = 500, Net factor income from abroad = 1000

b) In a three sector model what are the money flows between the government sector and firms, and the government sector and household sector.

8 a) What is inflation? What are the monetary policy measures to control inflation

**PART C**

*Answer any four questions, each carries 10 marks.*

9 a) Suppose the initial cash outlay on a project is Rs.1,00,000 and life of the project is 5 years. The salvage value is Rs.6000 and the annual income after tax and depreciation are Rs.6000, 10000, 14000, 18000 and 22000 from year 1 to 5 respectively. Estimate ARR.

b) What is a decision tree?

10 a) The initial investment on a project is Rs.50000 and the cost of borrowing is 10%. If the cash flows after tax are Rs.30000, 20000 and 10000 from year 1 to 3, estimate NPV of the project.

b) Give any two merits and demerits of NPV method

11 a) What is savage principle? A pay off matrix is given below. Which alternative will be selected according to the savage principle or minimax regret? (estimate regrets)

<table>
<thead>
<tr>
<th>Possible future demand</th>
<th>Alternatives</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small facility</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Medium facility</td>
<td>14</td>
<td>17</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Large facility</td>
<td>8</td>
<td>9</td>
<td>19</td>
<td></td>
</tr>
</tbody>
</table>

12 a) Explain accounting equation?

b) Give any two uses and limitations of a balance sheet.

13 a) Explain any three qualitative methods of demand forecasting.

b) Give any four advantages and disadvantages of foreign capital

14 a) What are the major differences between a money market and capital market?

b) Distinguish between direct tax and indirect tax.
PART A

Answer any three questions, each carries 10 marks.

1. a) What is a production possibility curve? Suppose a country's production is at a point inside the PPC. What does it imply? Draw a diagram and explain.
   (6)

   b) State the law of diminishing marginal utility. Explain any three of its limitations.
   (4)

2. a) Define Economics in terms of scarcity of resources? Why does the problem of choice arise in an economy?
   (6)

   b) Identify the type of goods from the sign of elasticity.
   i) positive price elasticity
   ii) negative income elasticity
   iii) positive cross elasticity
   iv) negative cross elasticity
   (4)

3. a) Suppose population increases. How does it affect equilibrium price and quantity? Draw a diagram and explain.
   (6)

   b) Suppose price of 'Y' increased from Rs.10 to 12 and the demand for its related good 'X' increased from 50 units to 60 units. Estimate cross elasticity of demand. What type of goods are 'X' and 'Y'?
   (4)

4. a) State the law of variable proportion. Explain the law with the help of a schedule.
   (6)

   b) A production function is given as \( Q = AL^\alpha K^\beta \). What does \( \alpha \) and \( \beta \) represent? What is constant returns to scale? Cobb-Douglas production function represent constant returns to scale. Why?
   (4)

PART B

Answer any three questions, each carries 10 marks.

5. a) Suppose AVC<P<AC. Will this firm produce or shutdown in the short run? Draw a diagram and explain.
   (6)

   b) What is social cost?
   (4)
6  a) Suppose the TFC of a firm is Rs.50000/- and its current sales is for Rs.75000/-. If the TVC of the firm is Rs.60000/- and price equals Rs.25/- per unit calculate the following.
   i) Contribution    ii) P.V Ratio    iii) Break-even sales    iv) Break-even output
b) What are the features of perfect competition?  

7  a) Define GDP. How will you derive the following from GDPmp?
   i) NDPmp  ii) GNPmp  iii) GNPfc
b) Prepare a chart and explain the circular flow in a two sector model with saving and investment.

8  a) What are the effects of inflation on production and distribution?
b) What is repo and reverse repo rate?

**PART C**

Answer any four questions, each carries 10 marks.

9  Suppose the capital outlay on a project is Rs.10000/- and the cost of capital is 10%. The cash flows from year 1 to 5 are Rs.2000, 3000, 4000, 3000 and 2000. Estimate NPV and payback.

10  a) What is IRR? What is the decision rule when IRR is the criteria for investment decision making? Point out any two merits and demerits of IRR
b) What is cost-benefit analysis?

11  a) A payoff matrix is given below. Which alternative a manager will select according to i) Maximin principle   ii) Maximax principle   iii) Laplace principle under conditions of uncertainty. Give reason for your selection.

<table>
<thead>
<tr>
<th>Possible future Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternatives</td>
</tr>
<tr>
<td>Small facility</td>
</tr>
<tr>
<td>Medium facility</td>
</tr>
<tr>
<td>Large facility</td>
</tr>
</tbody>
</table>

b) What is a decision tree?

12  a) Explain the components of a balance sheet.
b) What are the limitations of a balance sheet?
13  a) Distinguish between foreign direct investment and foreign port-folio investment. (6)

b) What are the merits and demerits of direct taxes? (4)

14  a) The data given below shows the number of cars sold in a showroom. Predict the sales for the year 2020 by using the method of least squares. (6)

<table>
<thead>
<tr>
<th>Year</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of cars sold</td>
<td>50</td>
<td>70</td>
<td>60</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

b) Explain any two qualitative methods of demand forecasting. (4)

****
Course Code: HS210
Course Name: LIFE SKILLS

Max. Marks: 50
Duration: 2 Hours

PART A
Answer all questions, each carries 6 marks.

1 a) Differentiate between Group Communication and Public Communication with an example. (3)
   b) What are the means of non-verbal communication by which one can decide that the people in a group of three are strangers? (3)

2 a) In the recent floods in Kerala, if you were a rescuer, which kind of thinking would have been ideal there, vertical or lateral thinking? Why? (3)
   b) Give the white, red, and blue hats thinking (out of the six thinking hats) of the recent Supreme Court verdict on the Demolition of Flats in Maradu, Kochi. (3)

3 a) Is team or group preferred for situations of i) rescue ii) investigation iii) political campaign? Justify your choices. (3)
   b) Suggest Team Performance Cycle for a newly selected college cricket team for University Championship. (3)

4 a) How can an Engineering UG student maintain academic integrity? (2)
   b) These days, the offence and violence against women and girls in work places and society are increasing at an alarming rate. How do you see this in terms of Rights Theory and Moral Autonomy? (4)

5 a) Differentiate between Transactional Leadership and Transformational Leadership. (2)
   b) How would you map the leadership types of the following on the Leadership grid?
      i) a military operation ii) a charity work iii) a public sector bank iv) An airplane on-board crew (4)
PART B

Read carefully the following case and answer the questions given below, it carries 20 marks.

(Case study)

Mr. Kumar realized that he had forgotten to take his laptop from train, only when he got into a taxi from Howra railway station. He had to travel to the airport from the railway station to catch a flight to Chennai. The flight would leave in 90 minutes and he had to travel 45 minutes to reach the airport. He was in a dilemma as he could not miss the flight, but what he would be losing will be his valuable research work. People gathered around him as he cried out in panic that he has forgotten to take his laptop from the train. They suggested that he should go back and check if the train was still in the platform. He knew that the train would long have gone from there and in a crowded train, the probability of getting the laptop back was slim. Also, he had a heavy suitcase with valuables inside.

Suddenly he received a call from Mr. Sarkar, the train’s loco-pilot, that he had Mr. Kumar’s laptop with him. He asked Kumar to rush to the platform where the train had stopped at the extreme end on its way to the workshop yard. Extremely surprised and relieved, Kumar rushed to the platform. While running as fast as possible, Kumar saw Dina, a porter, telling him, “You run, I’m behind you with your suitcase, don’t worry”. Dina carried the heavy suitcase on his head and ran behind Kumar.

Kumar reached the yard and collected his laptop from Mr. Sarkar. After thanking him, Kumar realized that he had lost connection with Dina. That means, he lost his suitcase when he got his laptop back. Devastated Kumar came back to Howra station and happened to meet Mr. Rai, a taxi broker on duty, who was there among the people while Kumar was complaining about his lost laptop hours ago. Rai decided to help Kumar to trace out his lost suitcase by finding out Dina since he felt it was his duty to help Kumar as all these incidents happened in front of his eyes. He took Kumar to different corners of the area searching for Dina and complained to their leader about the theft Dina did to a non-native traveller. All the efforts went in vain as they could not find Dina even after searching for one hour. Highly demoralized Kumar was about
to leave after thanking Rai for his sincere help. Then, to the surprise of everyone around there, Dina was brought before them by a group of people.

In tears, Dina told them that he had not stolen anything, instead, when he realized that Kumar was heading towards the yard and would take some time to return, he stopped chasing Kumar and handed the suitcase to the police counter on the platform, and went about his work. Everyone appreciated his honesty. Kumar could not believe that he got back all his lost belongings in a span of three hours in a crowded Metro City Railway station. He rewarded Rai and Dina with some money as a token of gratitude. He missed the flight on that day but travelled peacefully with a satisfied mind the next day.

6  a) Who are the key players here? (3)
b) What could have Kumar done had he not received the call from Mr. Sarkar? (7)
c) Who has more empathy towards Kumar here, Sarkar, Rai or Dina? Why? (4)
d) Which incident do you feel is the best example of integrity? (4)
e) Would you justify Kumar’s gesture of rewarding them with money? (2)

****
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY  
THIRD SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019  
Course Code: MA201  
Course Name: LINEAR ALGEBRA AND COMPLEX ANALYSIS  
Max. Marks: 100 Duration: 3 Hours  

PART A  
Answer any two full questions, each carries 15 marks  

1. a) Check whether the function \( f(z) = \begin{cases} \text{Re} \left( \frac{z^2}{|z|} \right), & z \neq 0 \\ 0, & z = 0 \end{cases} \) is continuous at \( z = 0 \). (7)  
b) Show that if \( f(z) = u(x, y) + iv(x, y) \) is analytic, then \( u(x, y) \) and \( v(x, y) \) satisfy Cauchy-Riemann equations. (8)  

2. a) Determine the region in the \( w \)-plane into which the triangular region bounded by \( x = 1, y = 1 \) and \( x + y = 1 \) is mapped by \( w = z^2 \). (7)  
b) Find the linear fractional transformation that maps \( (-2, 0, 2) \) onto \( (\infty, \frac{1}{4}, \frac{3}{8}) \). Under this transformation what is the image of the \( x \)-axis? (8)  

3. a) Find the real part of an analytic function whose imaginary part is \( v = e^{-x}(x \cos y + y \sin y) \). Also find the corresponding analytic function. (7)  
b) Prove that \( W = \frac{z}{1-z} \) maps the upper half plane \( y > 0 \) into the upper half plane of \( w \)-plane. What is the image of \( |z| = 1 \) under this mapping? (8)  

PART B  
Answer any two full questions, each carries 15 marks  

4. a) Use Cauchy’s Integral formula to evaluate \( \oint_C \frac{z^2 + 1}{z^2 - 1} \, dz \) counter clock wise around \( (i) |z - 1| = 1 \) \( (ii) |z + 1| = 1 \) \( (iii) \text{ is closed} \) (7)  
b) Find the Laurent’s series of \( \frac{1}{(z-1)(z-2)} \) in \( (i) 1 < |z| < 2 \) \( (ii) |z| > 2 \) \( (iii) 0 < |z-1| < 1 \) \( (iv) \text{ is closed} \) (8)  

5. a) Use Cauchy’s Residue theorem to evaluate \( \oint_C \left( \frac{Ze^{\pi z}}{z^4 - 16} \right) \, dz \), where \( C \) is the ellipse \( 9x^2 + y^2 = 9 \). (7)  
b) Evaluate \( \int_0^{2\pi} \frac{d\theta}{\sqrt{2 - \cos \theta}} \) using contour integration. (8)  

6. a) Evaluate \( \int (\text{Re } z) \, dz \) along the real axis from 0 to 1 and then along a straight line parallel to imaginary axis from 1 to \( 1 + 2i \). (7)
b) Evaluate \( \int_{-\infty}^{\infty} \frac{1}{(x^2+1)^2} \, dx \) using contour integration. (8)

**PART C**

*Answer any two full questions, each carries 20 marks*

7) a) Solve the system of equations using Gauss Elimination method:
   \begin{align*}
   y + z - 2w &= 0, \\
   2x - 3y - 3z + 6w &= 2, \\
   4x + y + z - 2w &= 4
   \end{align*}
   (8)

b) If the matrix
   \[
   \begin{bmatrix}
   1 & -2 & 3 & 1 \\
   2 & 1 & -1 & 2 \\
   6 & -2 & a & b
   \end{bmatrix}
   \]
   is of rank 2, find the values of \( a, b \). (6)

c) Check whether the vectors \([1, 2, 1], [2, 1, 4], [4, 5, 6], [1, 8, -3]\) are linearly dependent in \( R^3 \). (6)

8) a) Diagonalise the symmetric matrix
   \[
   \begin{bmatrix}
   6 & -2 & 2 \\
   -2 & 3 & -1 \\
   2 & -1 & 3
   \end{bmatrix}
   \]
   (8)

b) If one eigen value of the matrix
   \[
   A = \begin{bmatrix}
   -2 & 2 & -3 \\
   2 & 1 & -6 \\
   -1 & -2 & 0
   \end{bmatrix}
   \]
   is 5, find the other eigen values without finding the characteristic equation. What are the eigen values of \( A^2 \) and \( A^{-1} \). (6)

c) Reduce the quadratic form
   \( q = 3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy \)
   to the canonical form. Examine the definiteness. (6)

9) a) Find a matrix \( B \) which transform
   \[
   A = \begin{bmatrix}
   1 & 0 & -1 \\
   1 & 2 & 1 \\
   2 & 2 & 3
   \end{bmatrix}
   \]
   in to the diagonal form. (10)

b) Find a basis and dimension for the row space, column space and null space for the matrix A
   \[
   A = \begin{bmatrix}
   1 & 2 & 0 & 2 & 5 \\
   -2 & -5 & 1 & -1 & -8 \\
   0 & -3 & 3 & 4 & 1 \\
   3 & 6 & 0 & -7 & 2
   \end{bmatrix}
   \]
   (10)

****
APJ ABDUL KALAM TECHNOCOLICAL UNIVERSITY  
THIRD SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019  
Course Code: MA201  
Course Name: LINEAR ALGEBRA AND COMPLEX ANALYSIS  
Max. Marks: 100  
Duration: 3 Hours  

PART A  

Answer any two full questions, each carries 15 marks  

<table>
<thead>
<tr>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 a) Prove that the function $\sin z$ is analytic and find its derivative. (7)</td>
</tr>
<tr>
<td>2 a) Find the analytic function whose imaginary part is $v(x,y) = \log(x^2 + y^2) + x - 2y$. (7)</td>
</tr>
<tr>
<td>3 a) Show that $f(z) = \begin{cases} \frac{\text{Re}(z)}{</td>
</tr>
</tbody>
</table>
| 4 a) Using Cauchy’s integral formula, evaluate $\int_C \frac{e^z}{(z^2+4)(z-1)^2} \, dz$, where $C$ is the circle $|z - 1| = 2$.
  b) Evaluate $\int_0^{2+i} (z)^2 \, dz$ along
    (i) the real axis to 2 and then vertically to $2 + i$.
    (ii) the line $2y = x$. (8) |
| 5 a) Find all singular points and residues of the functions (7) |
(a) \( f(z) = \frac{z - \sin z}{z^2} \) (b) \( f(z) = \tan z \)

b) Evaluate \( \int_0^{2\pi} \frac{1}{5 - 3 \sin \theta} d\theta \). (8)

6 a) Evaluate \( \int_C \log zdz \) where \( C \) is the circle \(|z| = 1\) (7)

b) Evaluate \( \int_{-\infty}^{\infty} \frac{x^2}{(x^2 + 1)(x^2 + 4)} dx \) (8)

**PART C**

*Answer any two full questions, each carries 20 marks*

7 a) Find the rank of the matrix

\[
\begin{bmatrix}
1 & 2 & 3 & 4 \\
2 & 1 & 4 & 5 \\
1 & 5 & 5 & 7 \\
8 & 1 & 14 & 17
\end{bmatrix}
\] (8)

b) Find the values of \( a \) and \( b \) for which the system of linear equations

\[
x + 2y + 3z = 6, \ x + 3y + 5z = 9, \ 2x + 5y + az = b
\]

(i) no solution

(ii) a unique solution  (iii) infinitely many solutions

C) Show that the vectors \([3 \ 4 \ 0 \ 1]\), \([2 \ -1 \ 3 \ 5]\) and \([1 \ 6 \ -8 \ -2]\) are linearly independent in \( \mathbb{R}^4 \). (5)

8 a) Solve the system of equations by Gauss Elimination Method:

\[
3x + 3y + 2z = 1, \ \ x + 2y = 4, 10y + 3z = -2, \ \ 2x - 3y - z = 5
\]

b) Find the nature, index, rank and signature of the quadratic form

\[
x_1^2 + 2x_2^2 + 3x_3^2 + 2x_1x_2 - 2x_1x_3 + 2x_2x_3
\]

C) Find the Eigen values and Eigen vectors of

\[
\begin{bmatrix}
4 & 2 & -2 \\
2 & 5 & 0 \\
-2 & 0 & 3
\end{bmatrix}
\] (6)

9 a) Diagonalize the matrix

\[
A = \begin{bmatrix}
2 & -1 & 1 \\
-1 & 2 & -1 \\
1 & -1 & 2
\end{bmatrix}
\] (8)

b) Define symmetric and skew symmetric matrices. Show that any real square matrix can be written as the sum of a symmetric and a skew symmetric matrix. (6)

c) What type of conic section is represented by the quadratic form

\[
3x^2 + 22xy + 3y^2 = 0
\]

by reducing it into canonical form. (6)

****
PART A

Answer any two full questions, each carries 15 marks

1. a) Check whether the function \( f(x + iy) = \frac{2xy^2}{x^2 + 3y^2}, \ x, y \neq 0, \ f(0) = 0 \) is continuous at the origin.
   
   b) Find an analytic function \( f(z) = u + iv \) whose real part is \( e^{-x}(x \cos y + y \sin y) \)

2. a) Check whether \( f(z) = \log z \) is analytic.
   
   b) Show that \( w = \frac{z-i}{z+i} \) maps the real axis of \( z \)-plane into the circle \( |w| = 1 \) and the half plane \( y > 0 \) into the interior of the unit circle \( |w| = 1 \) in the \( w \)-plane

3. a) Find the image of the infinite strip \(-2 \leq x \leq 2\) under the mapping \( w = e^z \)
   
   b) Find the image of the line \( y - x + 1 = 0 \) under the mapping \( w = \frac{1}{z} \)

PART B

Answer any two full questions, each carries 15 marks

4. a) Evaluate \( \int_C \frac{z^2 + 2z - 2}{z - 4} \ dz \) where \( C: |z| = 5 \), using Cauchy’s Integral formula.
   
   b) Evaluate \( \int_{C(1,1)}^{(4,2)} [(x + y)dx + (y - x)dy] \) along a straight line from (1,1) to (1,2) and then to (4,2)

5. a) Find the Laurent series expansion about the singularity \( z = 1 \) for the function \( \frac{1}{(z-1)^2(z+3)} \)
   
   b) Find the pole and residue of \( \frac{1}{(z^2+1)^3} \)

6. a) Using Cauchy’s residue theorem evaluate \( \int_C \frac{z^2}{(z-1)^2(z+2)} \ dz \) where \( C \) is \( |z - 2| = 2 \)
   
   b) Evaluate \( \int_{0}^{\pi} \frac{a \ d\theta}{a^2 + \sin^2 \theta} \)

PART C

Answer any two full questions, each carries 20 marks

7. a) Using Gauss elimination method, solve the equations \( x + 2y + 3z - w = 10 \), \( 2x + 3y - 3z - w = 1 \), \( 2x - y + 2z + 3w = 7 \), \( 3x + 2y - 4z + 3w = 2 \).
b) Check whether the vectors \( X_1 = (2, -1, 3, 2) \), \( X_2 = (1, 3, 4, 2) \) and \( X_3 = (3, -5, 2, 2) \) are linearly independent or not

8 a) For what values of \( \mu \), the system of equations \( x + y + z = 1, x + 2y + 4z = \mu \) and \( x + 4y + 10z = \mu^2 \) got (i) unique solution (ii) infinite solution (iii) No solution.

b) If the eigen values of the matrix \( A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix} \) are 1, 2 and 3. Find the eigen values of \( A^5 \) and \( A^{-1} \) without using characteristic equation.

9 a) Find the nature, rank and signature of the quadratic form

\[ 3x^2 + 5y^2 + 3z^2 - 2xy + 2xz - 2yz \]

b) Diagonalise \( \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix} \)
Course Code: EE207  
Course Name: COMPUTER PROGRAMMING

Max. Marks: 100  
Duration: 3 Hours

PART A  
Answer all questions, each carries 5 marks.

1. How does x++ differ from ++x? Explain with suitable example. (5)
2. Explain go to and label statements with an example. (5)
3. Write a C program to find length of a string without using string handling function. (5)
4. Discuss the auto and static storage class with example. (5)
5. Explain following terms associated with pointer (i) Chain of pointers (ii) Pointer expression (iii) Scale factor. (5)
6. Write a C program to find the largest element in array using pointer. (5)
7. Distinguish between following functions (i) getc and getchar (ii) printf and fprintf (iii) feof and ferror. (5)
8. Explain the following control statements in python. (i) for loop (ii) if elif else. Also write their syntax. (5)

PART B  
Answer any two full questions, each carries 10 marks.

9. a) List the different operators in C. Discuss about conditional operator. (5)
    b) Draw a flow chart to check given number is palindrome or not. (5)
10. a) Railway Department Charges are given below:

<table>
<thead>
<tr>
<th>Distance(kms)</th>
<th>Rate/km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upto 30</td>
<td>Rs. 5/-</td>
</tr>
<tr>
<td>31-50</td>
<td>Rs. 8.25/-</td>
</tr>
<tr>
<td>&gt;50</td>
<td>Rs. 10/-</td>
</tr>
</tbody>
</table>

Senior citizens (age>=60) are given a concession of 30% on the fare. Write a program to print the details of a passenger’s name, age, distance traveled and the ticket fare.
b) What is the difference between compiler and interpreter? (4)

11 Write a C program to find the solution of a quadratic equation (real and distinct, equal or complex roots) using switch construct. Draw the flow chart also.

PART C

Answer any two full questions, each carries 10 marks.

12 a) Write a C program to read a matrix $A$ and find the product $A \ast A^T$. (8)
   b) Discuss any two string handling function. (2)

13 a) Write a C program to print first $n$ Fibonacci numbers using recursive function. (5)
   b) Explain the differences between pass by value and pass by reference with the help of example. (5)

14 Write a C program to read the array elements and to sort them in ascending order. Use functions to read, sort, and print the array. (10)

PART D

Answer any two full questions, each carries 10 marks.

15 A student database stores following information about students in a class: Roll number, name, gender and CGPA. Write a program to prepare a rank list based on CGPA. Also prepare a list of students having CGPA less than 7. (10)

16 a) What is the output of the program:

   ```c
   main()
   {
       int m[2]={100,200};
       int a,b,c,*p=m;
       a=*p;
       b=*p+1;
       c=(*p+1);
       printf("%d %d %d", a,b,c);
   }
   ``` (5)
   b) Write a program to read integer numbers from one file and then save into another file. (5)

17 a) Write a python program to check the largest among the three numbers. (4)
   b) Explain user defined functions in python with syntax. Write your own function to print “Hello Python”. (6)

****
PART A

Answer all questions, each carries 5 marks.

1. Which are the logical operators used in C language. Explain with example.

2. With suitable example explain the syntax of switch -case statement in C language.

3. Write a C program to read an array of integers and search for the occurrence of a given value.

4. What is the use of a static variable? Explain with example.

5. Define a structure and union with following as members - an integer variable, a character array having 20 characters, and a floating point variable. How many bytes are allotted for each? Illustrate and explain.

6. Write a C program to swap two variables using pointers.

7. Which are the different options for opening a file in C. Explain any four with example.

8. What are the advantages of Python as a programming language? Write a Python program to find the larger of two numbers.

PART B

Answer any two full questions, each carries 10 marks.

9. a) Write an algorithm and draw flow chart for finding the number of numbers divisible by 3 between 100 and 200.

10. a) Which are the basic data types in C language? How the memory allocation is done for each data type.
    b) Write a C program to swap two numbers without using third variable

11. a) Write a C program to find the sum of the digits of a number.
    b) Write a C program to print first 10 numbers of Fibonacci series.

PART C

Answer any two full questions, each carries 10 marks.

12. a) Give the syntax and example for two methods of reading a string.
    b) Write a C program for multiplication of two matrices.

13. a) Write a C program to read a string and check whether it is palindrome or not.
    b) What are the advantages of recursive function? Write a recursive function using C to find the factorial of a number.
14  a) What are the advantages of functions? Explain how it is implemented in C Language. (4)  
   b) Write a C program to prepare a rank list based on marks for five subjects, using three separate functions to read the marks, prepare rank list and print the same. (6)  

**PART D**  
*Answer any two full questions, each carries 10 marks.*  
15  a) Differentiate between ‘&’ operator and ‘*’ operator in C with help of a suitable example. (3)  
   b) Write a C program to sort an array of integers using pointers. (7)  
16  a) Write a C program to accept a string using pointers and print the third character of the same. (3)  
   b) Write a C program to read and write 10 integers to a file *number.txt*, open the file and copy the odd numbers to *odd.txt* and even numbers to *even.txt*. (7)  
17  a) Write a Python program to print the sum and product of two real numbers. (5)  
   b) Write a Python program to concatenate two strings. (5)  

****