VIDYA ACADEMY OF SCIENCE AND TECHNOLOGY

TECHNICAL CAMPUS, KILIMANOOR

"A Unit of Vidya International Charitable Trust"

Kilimanoor, Thiruvananthapuram

Accredited by NAAC with "B++" Grade

S6 EEE

ALL SUBJECT QUESTION BANK

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

S6 EEE

EET302- LINEAR CONTROL SYSTEMS

Module 1

Sl No.	Questions	Marks	KU/ KTU (Month /Year)
1	Give a comparison between open loop &closed loop control systems	5	KTUDec2017
2	Obtain the force voltage analogy of a general mechanical translational system.	5	KTUDec2017
4	Obtain the transfer function of an armature-controlled DC motor.	5	KTUDec2017
5	Derive the closed loop transfer function for a non-unity feedback system.	5	KTUDec2018
6	Explain the features and control applications of Tacho generators.	4	KTU Sep2020
7	Derive the transfer function of the Field controlled DC servo motor and hence explain the system characteristics?	6	KTU Sep2020
8	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	KTU Sep2020
9	Explain the constructional features and principle of operation of a synchro? What are the advantages of a stepper motor? List two applications of the stepper motor?	10	KTUMay2019
10	With relevant characteristics, explain the applications of synchro transmitter and receiver units?	5	KTU Sep2020
11	Derive the closed loop transfer function for a non-unity feedback system.	5	KTUDec2018

Module 2			
Sl No.	**Questions**	**Marks**	**KU/ KTU (Month/Year)**
1	Obtain the unit step response of the first order system?	5	KTUDec2019
2	What are the standard test signals used for time domain analysis?	4	KTUDec2019
3	Derive the expression for maximum peak overshoot, rise time and peaktime of a second order system for a step input?	6	KTUDec2019
4	A unity feedback system is characterized 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	KTUDec2018
5	Derive the closed loop transfer function for a non-unity feedback system.	5	KTUDec2018
6	Derive an expression for the step response of a critically damped second order system?	4	KTUDec2018
7	Determine the value of gain K and the natural frequency of oscillation ωn 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	KTUDec2018
9	Sketch the unit step response of an under damped second order systemand mark various time domain specifications.	3	KTUApril2018
10	Derive an expression for peak time and settling time of an under dampedsecond order system. A unity feedback control system is characterized by an open loop transfer function $G(s)=\frac{K}{s(s+10)}$ Determine the gain K so that the system will have a damping ratio of 0.5	10	KTUApril2018
11	Determine the unit step response for the system with transfer $T(s)=\frac{1}{(s^2+4s+5)}$ function. Also determine peak overshoot (Mp) and peak time (tp).	6	KTU Sep2020

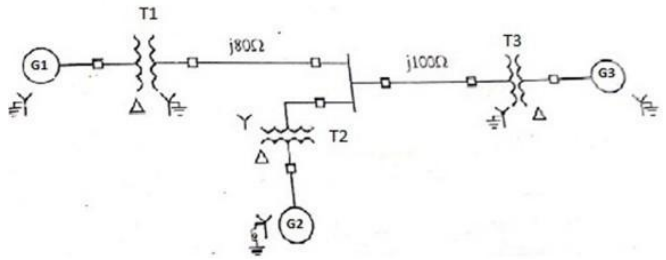
	Module 3		
Sl No.	**Questions**	**Marks**	**KU/ KTU (Month/Year)**
1	What is the angle criterion referred to as the root locus?	5	KTUDec2017
2	Explain the effect of addition of poles and zeros on the nature of root locus. Sketch the root locus for the open loop transfer function of a unityfeedback system given below,	10	KTUDec2017
3	(a) What is a root locus? What is the information obtained from a rootlocus? (b) Explain the effect of adding a pole to a system on time response.	8	KTUApr2018
4	Sketch root locus for a system with 20 (s)/ (s + 5 s + 5) having unity feedback system Hence determine the range of K for the system stability.	10	KTUApr2018
5	What is magnitude and angle criterion? Determine whether the points (- 4+j2) is on the root locus of a unity feedback system with forward transferfunction G(S)= K (S)/ s(s + 20 s + 8)	5	KTUDec2018
6	Ascertain stability of the system whose characteristic equationis s + 2s + 4s + 8s + 16s + 32; Also find the number of roots lying on the left half, right half andimaginary axis of the s-plane.	10	KTUApril2018
7	Check the stability of the system given by the characteristic equation s + 2s + 4s + 8s + 16s + 32;	5	KTUDec2018
8	(a) Consider a unity feedback system with an open loop transfer function$k/s(s+20)$. Determine the value K which would result in a steady state error of 0.05 for a unit ramp input. (b) Using Routh-Hurwitz criterion determine the value of K for which the closed loop system transfer function is stable, marginally stable and unstable.	10	KTUDec2018
9	Discuss about the effect of addition of poles and zeros to the open-looptransfer function G(s) H(s) on the root locus.	4	KTUDec2018, 2019
10	Explain important rules for root locus?	4	KTUDec2019
11	How do you determine the angle of departure of the root locus branchfrom an open loop pole, using angle criterion?	5	KTU Sep2020

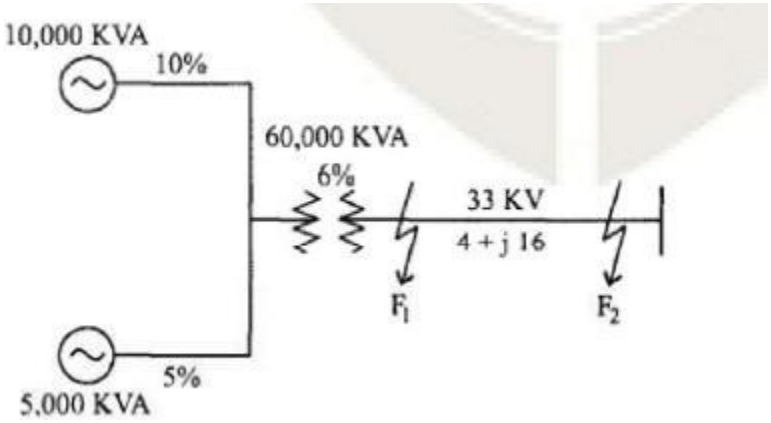
Module 4			
Sl No.	**Questions**	**Marks**	**KU/KTU (Month/ Year)**
1	(a) Define any three frequency response specifications used for the designof the control system? (b) Explain how the stability of a system is analyzed using a Bode plot?	10	KTUDec2018
2	Derive an expression for resonant frequency and resonant peak of asecond order system.	5	KTUApril2018
3	Construct bode plot for the system whose open loop transfer function is G(S)H(S)=K/(S+4)Determine the following: i) Gain margin ii) Phase margin iii) Closed loop stability	10	KTUApril2018
5	Determine the phase cross over frequency of a system with open looptransfer function K/(S+2)	10	KTUDec2017
6	(a)Explain any three frequency domain specifications of a control system. (b)The open loop transfer function of system is given by G(S)=[6/(S+1)(S+2)] Draw the bode plot and obtain the gain and phase crossover frequencies.	10	KTUDec2017
7	Define the phase cross over frequency and gain cross over frequency of a system.	5	KTUDec2017
8	Explain Gain margin and Phase margin of a system.	5	KTUApril2018 Dec 2017,2019
9	Find the value of open loop gain k for G(s)H(s)= [K/(S(05S+1)(0.04S+1)so that the system has a) phase margin of 10dB) gain margin 15 dB using Bode plot	10	KTUDec2019
10	Derive and explain the dependence of damping factor on the resonantpeak (Mr) of a second order system?	5	KTU Sep2020
11	Explain the significance of gain crossover frequency and phase crossover frequency in the system performance with suitable characteristics.	5	KTU Sep2020

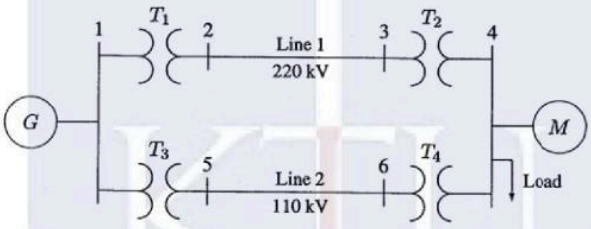
Module 5			
Sl No.	**Questions**	**Marks**	**KU/KTU (Month/Year)**
1	State and explain Nyquist stability criterion	5	KTUApril, Dec2018, 2017
2	Differentiate between minimum phase and non-minimum phase systemswith suitable examples.	5	KTUDec2017
3	Sketch the polar plot of a unity feedback control system having an open loop transfer function Also determine the value of K so that: i) Gain margin is 20dB ii) Phase margin is 30	10	KTUApr2018
4	Draw Nyquist plot for the system whose open loop transfer function G(S)H(S)= K/[S(S+2)(S+10)] Determine the range of K for which the closed loop system is stable	10	KTUApr2018
5	(a) Test the stability using Nyquist criterion, for the system with open looptransfer function G(S)H(S)= K/[S(S+2)(S+10)] (b) Compare between non minimum phase systems and minimum phasesystems?	10	KTUSep2020
6	Explain the salient features and advantages of Nichols chart in Controlsystem design.	5	KTUSep2020
7	State and explain Nyquist stability criterion?	5	KTU Sep2020
8	Obtain the polar plot and hence determine the value of K such that the system with open loop transfer function G(s)=K/s (s + 1)(s + 4) is marginally stable?	5	KTU Sep2020

QUESTION BANK

Subject: Power system II (EET 304) S6 EEE

Sl No.	Question	Marks	
	Module 1		
1	The generator neutral grounding impedance appears as 3Zn in the zero-sequence network. Why?	3	Model QP
2	The single line diagram of an unloaded power system is shown in the figure. The generator and transformer are rated as: G1= 20MVA, 13.8kV, X"=20%; G2=30MVA, 18kV, X"=20%; G3=30MVA,20kV, X" =20%; T1=25MVA,220/13.8kV, X=10%, T2=3 single-phase units each rated at 10MVA, 127/18kV, X=10%, T3=35MVA, 220/22kV, X=10%. Draw the reactance diagram using a base of 50 MVA and 13.8kV on generator G1. 	10	KTU (JULY 2021)
3	Draw the zero sequence, negative sequence, and positive sequence network of a generator grounded through a reactance	4	KTU (JULY 2021)
4	A 30 MVA, 13.8 KV, 3-phase generator has a sub transient reactance of 15%. The generator supplies 2 motors through a step-up transformer - transmission line – step-down transformer arrangement. The motors have rated inputs of 20 MVA and 10 MVA at 12.8 KV with 20% sub transient reactance each. The 3-phase transformers are rated at 35 MVA, 13.2 KV -Δ /115 KV-Y with 10 % leakage reactance. The line reactance is 80 ohms. Draw the equivalent per unit reactance diagram by selecting the generator ratings as base values in the generator circuit.	10	KTU (SEP 2020)

5	Derive the expression for fault current for a single line to a ground fault occurring in an unloaded generator. Also, draw the interconnection of sequence networks.	6	KTU (JULY 2021)
6	The symmetrical components of phase voltages in a 3-phase unbalanced system are Va0=10∠1800 V, Va1=50∠0 0 V and Va2=20∠900 V. Determine the phase voltages Va, Vb, and Vc	6	KTU (DEC 2019)
7	A 33 KV line has a resistance of 4 ohm and reactance of 16 ohm respectively. The line is connected to a generating station bus bar through a 6000 KVA step-up transformer which has a reactance of 6%. The station has two generators rated 10,000 KVA with 10% reactance and 5000 KVA with 5% reactance. Calculate the fault current and short circuit KVA when a 3-phase fault occurs at the HV terminals of the transformers and at the load end of the line. 	10	KTU (DEC 2023)
8	The one-line diagram of a three-phase power system is shown in figure below. Select the common base of 100 MVA and 22 kV on the generator side. Draw an impedance diagram with all impedances including the load impedance marked in per unit. The manufacturer's data for each device is given as follows. The three-phase load at bus 4 absorbs 57 MVA, .6 power factor lagging at 10.45 kV. Line1 and Line 2 have reactances of 48.4 ohm and 65.3 ohm respectively.	10	Model QP

	<table><tr><td>G</td><td>90 MVA</td><td>22 kV</td><td>X=18%</td></tr><tr><td>T_1</td><td>50 MVA</td><td>22/220 kV</td><td>X=10%</td></tr><tr><td>T_2</td><td>40 MVA</td><td>220/11 kV</td><td>X=6%</td></tr><tr><td>T_3</td><td>40 MVA</td><td>22/110 kV</td><td>X=6.4%</td></tr><tr><td>T_4</td><td>40 MVA</td><td>110/11 kV</td><td>X=8%</td></tr><tr><td>M</td><td>66.5 MVA</td><td>10.45 kV</td><td>X=18.5%</td></tr></table> 		
9	What are the advantages of pu system? Obtain the expression for converting the per unit impedance expressed on one base to another.	4	Model QP
10	Derive the expression for fault current and draw the interconnection of sequence networks for the line to line fault on the terminals of an unloaded generator.	10	KTU (SEP 2020)
11	Explain different types of current limiting reactors	5	KTU (DEC 2019)

Module 2			
1	Explain the algorithm for load flow analysis using Newton-Raphson Method.	10	KTU (DEC 2019)

<table>
<tr>
<td>2</td>
<td>The line admittance of a 4-bus system are as under
<table>
<tr><td>Bus code</td><td>1-2</td><td>1-3</td><td>2-3</td><td>2-4</td><td>3-4</td></tr>
<tr><td>Admittance</td><td>2-j8</td><td>1-j4</td><td>0.666-j2.664</td><td>1-j4</td><td>2-j8</td></tr>
</table>
The schedule of active and reactive powers is:
<table>
<tr><th>Bus code</th><th>P</th><th>Q</th><th>V</th></tr>
<tr><td>1</td><td>--</td><td>--</td><td>1.06∠0</td></tr>
<tr><td>2</td><td>0.5</td><td>0.2</td><td>--</td></tr>
<tr><td>3</td><td>0.4</td><td>0.3</td><td>--</td></tr>
<tr><td>4</td><td>0.3</td><td>0.1</td><td>--</td></tr>
</table>
</td>
<td>10</td>
<td>KTU (JULY 2021)</td>
</tr>
<tr>
<td></td>
<td>Form YBUS and compute the voltage at bus 2 at the end of first iteration using the G-S method. Take =1.6</td>
<td></td>
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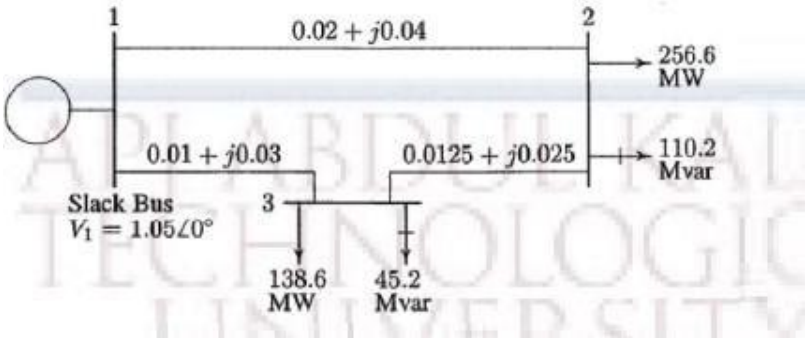
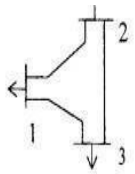
</tr>
<tr>
<td>3</td>
<td>Consider the three bus systems shown below. Each of the three lines has a series impedance of 0.02+j0.08 pu and a total shunt admittance of j0.02 pu. The specified quantities at the buses are tabulated below. A controllable reactive power source is available at bus 3 with the constraint 0≤ QG3≤ 1.5 PU. Find the load flow analysis using FDLF Method (one iteration)
<table>
<tr><th>Bus</th><th>Real load Demand, P_D</th><th>Reactive load demand, Q_D</th><th>Real power Generation, P_G</th><th>Reactive power Generation, Q_G</th><th>Voltage specification</th></tr>
<tr><td>1</td><td>2.0</td><td>1.0</td><td>Unspecified</td><td>Unspecified</td><td>$V_1 = 1.04 + j0$</td></tr>
<tr><td>2</td><td>0.0</td><td>0.0</td><td>0.5</td><td>1.0</td><td>Unspecified</td></tr>
<tr><td>3</td><td>1.5</td><td>0.6</td><td>0.0</td><td>$Q_{G3} = ?$</td><td>$|V_3| = 1.04$</td></tr>
</table>
</td>
<td>14</td>
<td>KTU (DEC 2023)</td>
</tr>
</table>

4	For the system shown in the figure obtain the load flow solution at the end of 2 iterations by Gauss-Seidel method. The line impedances are marked in per unit on a 100 MVA base.  	10	Model QP
5	A power system consists of 300 buses out of which 20 buses are generator buses and 25buses are provided with reactive power support. All other buses are load buses. Determine the size of the Newton Raphson load flow Jacobian matrix.	3	KTU (DEC 2022)
6	What is the need of slack bus in load flow analysis?	3	Model QP
7	Write down the steps involved in solving the load flow equation	7	KTU

	using Guass Siedel method when voltage-controlled buses are absent.		(SEP 2020)
8	Derive the static load flow equations for a power system.	10	KTU (SEP 2020)
9	Explain DC load flow.	4	Model QP
10	Give reasons for: i) Direct solution of load flow problem is not possible. ii) Bus admittance matrix is sparse matrix	5	KTU (DEC 2022)

11	Figure shows a three-bus power system. The impedance of each line is (0.026 + 0.11) pu. Assuming a flat voltage start, find the voltages and bus angles at the buses at the end of the first iteration using the Gauss-Siedel method.  The bus details are given in the table below	5	KTU May 2019

Bus	P_G(pu)	Q_G(pu)	P_L(pu)	Q_L(pu)	|Vi|(pu)	Angle	Remarks
1	-	-	1.0	0.5	1.03	0^0	Slack bus
2	1.5	-	0	0	1.03	-	PV bus
3	0	0	1.2	0.5	-	-	PQ bus

Module 3			
1	Starting from first principles derive the swing equation of a synchronous machine		Model QP
2	Using equal area criterion, derive an expression for critical clearing angle for a system having a generator feeding an infinite bus through a single circuit line.	10	KTU (DEC 2019)
3	Explain the method of solving swing equation by point-by-point method.	5	KTU (DEC 2019)
4	Explain PMU and Wide area network	6	KTU (DEC 2023)
5	Two generators rated at 4-pole, 50 Hz, 50 MW 0.85 p.f (lag) with a	8	Model

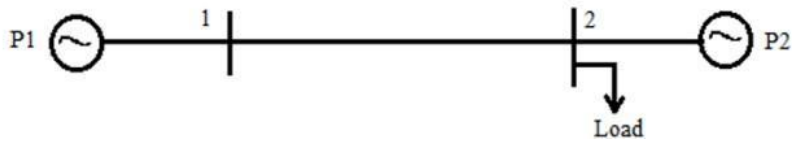
	moment of inertia28,000 kg-m2 and 2-pole, 50Hz, 75 MW 0.82 p.f (lag) with a moment of inertia 5,000 kg-m2 are connected by a transmission line. Find the inertia constant of each machine and the inertia constant of a single equivalent machine connected to an infinite bus. Take 100 MVA base.		QP

6	A 50 Hz generator is delivering 50% of the power that it is capable of delivering through a transmission line to an infinite bus. A fault occurs that increases the reactance between the generator and the infinite bus to 500% of the value before the fault. When the fault is isolated, the maximum power that can be delivered is 75% of the original maximum value. Determine the critical clearing angle for the condition described	10	KTU (DEC 2022)
7	Explain the steady-state limit of a power system with the help of a power angle diagram.	3	KTU (SEP 2020)
8	What are the methods of improving transient stability?	4	KTU (JULY 2021)
9	Give the simplified power angle equation and the expression for Pmax .Also draw the power angle curve.	4	KTU (JULY 2021)
10	Explain the critical clearing angle and its significance with respect to the stability of a power system.	3	Model QP
11	Explain the three different stabilities of a power system.	5	KTU (SEP 2020)

Module 4			
1	A 50Hz,4 pole turbogenerator of rating 20 MVA,13.2 kV has an inertia constant of H=9kW-sec/ kVA. Find the kinetic energy stored in the rotor at synchronous speed.	5	KTU (JULY 2021)
2	What are the main components of a speed governor system?	5	KTU (JULY 2021)
3	Two turbo-alternators rated for 110 MW and 210 MW have	10	Model
	governor drop characteristics of 5 percent from no load to full load. They are connected in parallel to share a load of 250 MW. Determine the load shared by each machine assuming free governor action.		QP

4	Develop and explain the block diagram of automatic load frequency control of an isolated power system.	10	KTU (DEC 2022)
5	A 100MVA synchronous generator operates on full load at a frequency of 50 Hz. The load is suddenly reduced by 50 MW. Due to time lag in the governor system, the steam valve begins to close after 0.4 s. Determine the change in frequency that occurs in this time. Given H= 5kW-s/kVA.	5	KTU (DEC 2019)
6	With a neat block diagram explain the automatic voltage regulator of a generator.	5	KTU (JULY 2021
7	Discuss the application of SCADA in power system monitoring	3	Model QP
8	Derive the block diagram representation of a generator-load model	5	KTU (DEC 2019
9	A 100 MVA synchronous generator operates on full load at a frequency of 50 Hz. Inertia constant is 8 MJ/MVA. The load is suddenly reduced 100 MW. Due to timelag in the governor system, the steam valve begins to close after 0.4 seconds. Determine the change in frequency that occurs in this time.	4	KTU (DEC 2023)
10	Draw the block diagram representation of Load Frequency Control (LFC) of a single area system & explain the steady-state stability for free governor operation	10	KTU (DEC 2019)
11	Enumerate the reasons for keeping strict limits on the system frequency variations.	4	Model QP

Module 5			
1	Explain unit commitment? List out the constraints on unit commitment.	3	Model QP

2	How loads are distributed between units within a plant?	5	KTU (DEC 2019)
3	A two-bus system is shown in figure below. If a load of 125MW is transmitted from plant 1 to the load, a loss of 15.625MW is incurred. Determine the generation schedule and the load demand if the cost of received power is Rs.24/MWhr. Solve the problem using coordination equations and the penalty factor method. The incremental production costs of the plants are: $dF_1/dP_1 = 0.025P_1 + 15$ $dF_2/dP_2 = 0.05P_2 + 20$ 	10	KTU (DEC 2019)
4	Write the conditions for the optimal power dispatch in a lossless system.	3	Model QP
5	Derive the equation for penalty factor for optimal system operation.	5	KTU (JULY 2021)
6	Draw fuel-cost curve and explain	4	KTU (JULY 2021)
7	The incremental fuel cost of two generating units G1 and G2 is given by IC1 = 25+0.2P1, IC2 = 32+0.2P2, where P1 and P2 are real powers generated by the unit. Find the economic allocation for a total load of 250 MW. Neglect the transmission losses.	4	KTU (DEC 2022)
8	The fuel inputs per hour of plants 1 and 2 are given as F1 = 0.2 P1^2 + 40 P1 + 120 Rs. per hr F2 = 0.25 P2^2 + 30 P2 + 150Rs. per hr Determine the economic operating schedule and the corresponding	6	Model QP

	cost of generation if the maximum and minimum loading on each unit is 100 MW and 25 MW, the demand is 180 MW, and transmission losses are neglected. If the load is equally shared by both the units, determine the saving obtained by loading the units as per equal incremental production cost		
9	What is the significance of thermal unit constraint in the unit commitment problem?	5	KTU (DEC 2019)
10	A power plant has 3 units with the following cost curves: C1 =P1^2 + 430 P1 +10000 Rs/hour C2 =2 P2^2 + 540 P2 +10000 Rs/hour C3 = 1.4 P3^2 + 320 P3 +18000 Rs/hour Maximum and minimum generation for each unit is 120MW and 36MW. Find the optimum scheduling for a total load of 200 MW	7	KTU (JULY 2021)
11	A 2 bus system consists of two power plants connected by a transmission line. The cost curve characteristics of the two plants are C1= 0.01P1^2+ 16P1+20 Rs/hr C2= 0.02P2^2 +20P2 +40 Rs/hr When a power of 120 MW is transmitted from plant 1 to load (near to plant 2), a loss of 14 MW has occurred. Determine the optimal scheduling of plants and load demand, if the cost of received power is 30 Rs./MWhr.	10	KTU (DEC 2023)

EET306 POWER ELECTRONICS

MODULE 1			
Sl.No	**Question**	**Marks**	**Month/Year**
1	a) "A thyristor can be triggered by an external gate pulse"- Justify using two transistor analogy of thyristor b) Draw the circuit for two transistor analogy of silicon controlled rectifier and briefly describe the working.	5 10	KTU APRIL 2018, OCT 2020
2	With neat sketches, explain the static V-I characteristics of an SCR. Define latching and holding current.	6	KTU APRIL 2018, DEC 2019, DEC 2017, June 2023
3	Compare the characteristic features of MOSFET and IGBT Explain the structural details of MOSFET.	4 8	KTU DEC 2019, Model
4	a) Explain the structure & principle of operation of IGBT. b) Draw RC triggering circuit for SCR and explain with relevant waveforms.	5 6	KTU DEC 2017
5	a) Discuss the condition which must be satisfied for turning on the SCR with a gate signal. b) Explain how di/dt and dv/dt protection is accomplished in SCR	4 10	KTU DEC 2017
6	Describe the reverse recovery characteristics of a power diode.	3	Model
7	Write short notes on wideband gap devices.	6	Model
8	Explain the Two transistor analogy of SCR with significant equation. List the importance of current gain factor in turn on process.		KTU June 2023
MODULE 2			
Sl.No	**Question**	**Marks**	**KTU Month/Year**
1	a) Draw the input and output voltage waveforms of single phase half controlled rectifiers feeding RL load in continuous and discontinuous conduction mode. b) Explain a half-wave controlled rectifier feeding RL load, with waveforms of output voltage and output current. Derive the expression for average output voltage.	3 6	KTU June 2023, Model
2	Compare the maximum power that can be handled by fully controlled rectifier in mid- point and bridge configuration if the firing angle is 30o and the reverse voltage rating (peak) of the thyristors is 200V.	5	KTU APRIL 2018

3	A single phase semi-converter fed from 120 V, 50 Hz supply is connected to a load resistance of 10 Ω. If the average output voltage is 25% of its maximum possible average output voltage, find the circuit turn off time.	4	KTU DEC 2019
4	A neat circuit diagram explains the operation of a Single Phase Half Wave Rectifier with R, load. Sketch the shape of output voltage waveform	6	KTU DEC 2019
5	Write short notes on pulse transformer.	4	Model
6	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 45o. Determine 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	6	KTU DEC2019
9	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 α=30	6	KTU OCT2020
	b) Obtain an expression for average dc output voltage of a 1-phase fully controlled rectifier for R load with firing angle, α.	4	
10	What is the role of freewheeling diode in a 3 phase semi-converter?	5	KTU APRIL 2018
11	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 α = 60	10	KTU APRIL 2018 , DEC,
	b) A three-phase half-wave controlled converter is connected to 380 V (line) supply. If the load current is constant at 32 A independent of the firing angle and on state forward drop of SCRs is 1.2 V, Find: i) Peak reverse voltage rating of SCRs ii) Average power dissipation in each SCR	4	KTU OCT 2020
12	The full-wave controlled bridge rectifier has an AC input of 220 V rms at 50 Hz and a 20 ohm load resistor. The delay angle is 400. Determine the average current in the load, the power absorbed by the load, and the source volt-amperes.	7	Model
13	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	5	KTU DEC2018

	values of load current		
14	a) With the help of circuit diagram explain the working of a three phase fully controlled converter.	5	KTU DEC2018
	b) Sketch the waveform of input voltage, output voltage and output current of a three phase fully controlled converter with R load operating at $\alpha = 30$	5	
15	Draw the output voltage waveform of a 3-phase controlled half wave rectifier for $\alpha=30$	5	KTU OCT 2020

MODULE 3

Sl.No	Question	Marks	KTU Month/Year
1	A single-phase half bridge inverter has a resistive load of 10 Ω, and a center-tap dc input voltage of 96 V. Obtain the Fourier series representation of the output voltage waveform and hence find the value of distortion factor.	4	KTU APRIL 2018
2	What are the different classifications of inverters?	5	KTU DEC 2017
3	a) Describe the working of a three phase voltage source inverter with an appropriate circuit diagram.	4	KTU APRIL 2018
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	KTU OCT 2020
5	Draw the circuit and explain the 180 degree operation of a 3 phase bridge inverter with R load. Draw the phase voltage and line voltage waveforms.	10	KTU DEC 2019, OCT 2020
6	A 50Hz single phase full bridge square wave inverter is fed from 500V dc input. Find output rms voltage and current for a load of R=5Ω and L=10mH.	10	KTU OCT 2020
7	a) Explain the operation of a single phase voltage controller with RL load with output voltage and current waveforms.	6	KTU APRIL2018
	b) For a single-phase voltage controller, develop a relationship between conduction angle and firing angle. Under what condition does the conduction angle equals π?	4	
8	For a single phase voltage controller feeding a resistive load, describe the working with reference to source voltage, source current, output voltage and output current.	10	KTU APRIL 2017

9	For a single phase ACVC with source voltage as , and load as , draw the output voltage and current waveforms if Thyristor firing angle is (i) α=300 (ii) α=900.	10	KTU OCT 2019
10	a) Explain the 120 degree conduction mode of a three-phase bridge inverter with output voltage waveforms, indicating the devices conducting in each state. b) Write short notes of THD.	10 4	KTU June 2023
11	a) Explain sinusoidal PWM technique for varying the magnitude of output voltage in a single-phase inverter . b) Briefly explain current source inverter	6 8	Model

MODULE 4

Sl.No	Question	Marks	KTU Month/Year
1	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	10	KTU APRIL 2018
2	For a type A chopper, dc source voltage is 230 V, load resistance 10 Ω, drop across the switch is 2 V and duty cycle 0.4. Calculate average and RMS value of output voltage and chopper efficiency.	5	KTU APRIL 2018
3	Draw the circuit of the step up chopper and explain its working. Derive an expression for average output voltage in terms of input dc voltage and duty cycle for a step up chopper.	5 7	KTU APRIL 2018, DEC 2017
4	Explain with circuit diagram and waveforms, the working of Buck regulator for continuous current mode. Obtain expressions for inductance and capacitance.	10	KTU DEC 2017
5	Explain the different methods by which control of output voltage is obtained in Choppers.	5	KTU DEC 2019
6	With circuit diagrams 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	KTU OCT 2020
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	KTU OCT 2020
8	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	KTU OCT 2020
9	In a step down chopper the dc input voltage is 100V. The MOSFET	5	KTU OCT

	switch has a switching frequency of 2kHz. Find the duty cycle and average dc output voltage if the turn on period of switch is 0.2ms		2020
10	a) Explain the working of a Buck-Boost regulator, showing relevant waveforms and derive the expression for its output voltage. b) Design a DC-DC Converter with 12 V input and 200 V output at upto 50 W. The ripple in the output voltage and input current should not exceed +- 5% and +- 20% respectively. Select suitable device and switching frequency.	8 6	Model
11	a) Describe the working of four quadrant chopper in all the four quadrants with relevant circuit diagrams. b) Briefly explain the current limit control in dc-dc converter	10 4	Model
MODULE 5			
Sl.No	**Question**	**Marks**	**KTU Month/Year**
1	Draw the block diagram of a closed loop speed control of an electric drive. Differentiate between passive and active load torques. What are the different components of a load torque? Explain each component in detail.	8 5	KTU April 18
2	a) Explain the working of a single phase full converter drive b) Explain the working of a four quadrant chopper drive	8 6	Model
3	a) Explain the stator voltage control for Induction motor drive b) Explain the working of v/f control of Induction motor drive	8 6	Model
4	A motor when operating in quadrant I and II has the characteristic T = 400 – 0.4N Nm, where N is the speed in rpm. The load which is coupled to the motor is an active load with the characteristic, T l = ±200 Nm. Calculate the motor speeds for motoring and braking operation in the forward direction. When the drive is operating in quadrant III and IV, motor has the characteristic T =- 400 - 0.4N Nm. What will be the equilibrium speed in quadrant	7	KTU April 18
5	Draw and explain the speed torque curves of a fan load and traction load	4	KTU April 18
6	Derive the mathematical condition to obtain the steady state stability of equilibrium point.	5	KTU April 19
7	What is an Electric Drive? Explain the function of each blocks with the help of a neat block diagram.	5	KTU April 19
8	Determine: (i)Torque and field current for the rated armature current, 750 rpm and 0.8 leading power factor	5	

	(ii)Armature current and power factor for half the rated motor torque, 1500 rpm and rated field current		
9	Draw and explain the forward motoring and regenerative braking operation of a chopper fed DC motor	10	KU May13
10	Explain the simultaneous and non simultaneous control of dual convertor	10	KU Oct14

EET 312 BIOMEDICAL INSTRUMENTATION

Module 1			
Sl No.	**Questions**	**Marks**	**KU/ KTU (Month/ Year)**
1	a)Write short notes on 1) resting potential 2) action potential? b)Explain the developments of action potential with respect to human cells with necessary figures. c) Write a short note on Resting potential, Action potential and Propagation of Action potential with Action potential waveform.	5	KTUDec2017
2	Identify the various types of transducers used in Biomedical engineering? Write principle of operation of any 5 transducers.	10	KTU April 2018
3	a)Write brief notes on respiratory parameters. b) Explain the measurement of respiratory parameters using spirometer.	5	KTU Decembe r 2019
4	What are bio signals? Give specific examples	5	KTUDec201 7, KTUDec202 0
5	a)With the help of a neat block diagram write how a man instrumentsystem working. b) Draw the block diagram of biomedical instrumentation system andexplain the functions of each block.	5	KTU May 2019
6	a)With the help of necessary figure explain the working of cardiovascular system of human body. b) What is cardiac vector? Explain ECG leads with necessary figures.	10	
7	Discuss what are the problems encountered in measurement on biological systems.	5	KTUDec2018
8	Briefly explain the physiological functions of human respiratory system.	6	KTU May 2019
9	a) Dicuss about surface electrodes. b) Explain the construction and working principle of microelectrodes c) Briefly explain different Bio potential electrodes d) Explain the effect of electrode potential on biosignals. e) Enumerate various skin surface electrodes. Write principle of operation of any THREE electrodes f) Mention the applications of floating and flexible type surface electrodes with necessary figures.	4	KTUDec2019
10	Discuss the functional organisation of peripheral nervous system.	5	KTUDec2017
11	Explain electro conduction pathway of heart.	6	KTUApril201 8

Module 2			
Sl No.	**Questions**	**Marks**	**KU/ KTU (Month/ Year)**
1	With the help of a neat diagram of the Einthoven triangle, mention the necessity of the Einthoven triangle.	5	KTUDec2019
2	With the help of neat diagram explain ultrasonic method of blood pressure measurement.	4	KTUDec2019
3	a)What is cardiac vector? Explain ECG leads with necessary figures. b) Explain the measurement of Cardiac output.	6	KTUDec2019
4	a)What is blood pressure? How it is measured? b) With help of neat diagram write how the oscillometric method helpsto measure blood pressure. c) Explain the direct method of blood pressure measurement. d) How we can measure Blood pressure using Fibre optic system. e) Explain auditory method of blood pressure measurements with necessary figure. f) Explain the Ultrasonic method of blood pressure measurement. g) Explain the direct method of blood pressure measurement. h)	5	KTUDec2018
5	a)Explain about pneumograph with relevant diagrams. b) Write short note on Respiratory pneumograph	4	KTUDec2018
6	a)Explain any one method to measure blood flow. b) Explain the method of blood flow measurement using electromagnetic blood flow meter. c) Explain the method of blood flow measurement using electromagnetic blood flowmeter.	6	KTUDec2018
7	With help of neat diagram explain phonocardiography.	3	KTUApril2018
8	a)Explain the measurement of respiratory parameters using spirometer. b) With neat diagram write the principle of working of a spirometer. c) Explain the measurement of respiratory parameters using Spirometer. d) Explain spirometer for measurement of respiratory parameters	10	KTUApril2018
9	Identify difference between Internal and External pacemakers.	9	KTUDec2017
10	Explain Einthoven triangle.	6	KTU Sep2020
11	Explain standered 10-20 electrode placement system for EEG measurement	5	KTUDec2017
12	Write short note on Photo plethysmograph	10	KTUDec2017
13	Discuss electrical conduction path way of heart and explain the working principle of artificial cardiac pacemaker with necessary figures	10	KTUDec2017

Module 3			
Sl No.	**Questions**	**Marks**	**KU/ KTU (Month/ Year)**
1	a)Explain the 10-20 system of EEG electrodes placement. b) Draw and explain the block diagram of EEG machine. C)Draw the different EEG waveforms and state its frequency. d) What are the applications of EEG waveforms? e) Explain standered 10-20 electrode placement system for EEG measurement f) What are brain waves? Write notes on measurement of EEG with necessary block diagram.	10	KTUDec2017
2	With neat diagram write the principle of working of a spirometer.	10	KTUDec2017
3	Explain ECG with a neat block diagram	8	KTUApr2018
3	Explain the significance of Einthoven triangle.	10	KTUDec2018
4	Write brief note on measurement of nerve conduction velocity.	4	KTUDec2018, 2019
5	a)What is the difference between internal and external pacemakers? b) Describe the working of electronic pacemaker with necessary diagram.	4	KTUDec2019
6	Explain DC defibrillator with the help of neat diagram	5	KTU Sep2020
7	Explain spirometer for measurement of respiratory parameters	10	KTU Sep2020
8	Write a short note on tidal volume and vital capacity in breathing mechanism with neat diagram.	6	KTU Sep2020
9	With neat diagram write how we can measure velocity of conductionin nerve.	10	KTUDec2019
10	With neat diagram EMG recorders	10	KTU Dec2017
11	Write brief note on Electromyography	5	KTUApril2018
12	Write brief note on Pneumography	5	KTU May 2019
13	Explain briefly measurements from the nervous system.	5	KTUMay2019

14	Write a short note on phonocardiography.	5	KTUDec2020

Module 4

Sl No.	Questions	Marks	KU/KTU (Month/ Year)
1	What are the different methods of accident prevention in hospitals?	10	KTUDec 2018
2	Differentiate between macro shock and micro shock.	10	KTUDec 2018
3	Explain the physiological effects of electric current.	6	KTUDec 2018
4	a)Explain the generation of X-rays and also mentionits applications in biomedical engineering. b) Explain the properties and biomedical applicationsof X-rays. c) Explain the biomedical applications of X-Ray withsupporting diagrams. e) Enumerate uses of X-rays-diagnostic still picture. f) With neat diagram explain the working of X-ray machine. Enumerate the uses of X-rays in medicine?	10	KTUDec 2019
5	Explain the principle of CAT scanning	5	KTUApril 2018
6	a)Explain the principle of MRI scanning b) Explain MRI and PET scanning.	10	KTUApri l 2018
7	Write how a Spectrophotometer help in blood test.	10	KTUDec 2017
8	Discuss the principle and application of diathermy.	10	KTUDec 2017
9	Mention different types of ventilators and write brief notes on the biomedical applications	5	KTUDec2017

10	List the main types of blood test and explain each	5	KTUApril2018,Dec 2017,2019
11	With the help of a block diagram explain the basic principle of Computer tomograph	10	KTUDec 2019
12	Enumerate commonly used chemical tests on bloodcells.	5	KTU Sep2020
13	Discuss the principle of Lithotripsy.	5	KTU Sep2020
14	Write brief notes on ultrasound scanning.	10	KTU Sep2020
15	Explain De-fibrillators.	5	KTU Sep2020
16	With neat diagram explain the working of Aritificalkidney.	10	KTUDec2017

Module 5			
Sl No.	**Questions**	**Marks**	**KU/KTU (Month/ Year)**
1	Write how a Flame photometer helps in blood test.	5	KTUDec2017
2	Identify how lithotripsy helps us. Write how it works.	5	KTUApril, Dec2018,2017
3	List out various physiological effects of electric current.	10	KTUApr2018
4	List various components in infant incubators? Mention function of components.	10	KTUDec2019
5	Identify the situation to use diathermy? Mention its applications?	10	KTU Sep2020
6	Write a short note haematocrit.	5	KTU Sep2020
7	a)Write a short note on Tele-medicine. b) Discuss telemedicine. What are its biomedical applications c) Explain telemedicine.	5	KTU Sep2020
8	What is infant incubator? Explain with necessary diagram.	4	KTU April 2018
9	Explain the physiological effects of electric current, specifying important susceptibility parameters with necessary figures.	5	KTU April 2018, May 2019
10	What is haemodialysis? Explain the working of an artificial kidney with necessary diagram.	10	KTUMay2019
11	Write short notes on blood cell counter.	5	KTUJan2022
12	What is micro shock? How it is affected to human body?	10	KTUJan2022
13	With the help of a block diagram explain the basic principle of Computer tomograph.	10	KTUJuly2022
14	Write a note on medical robotics	5	KTUDec2020

15	Explain different methods of electric accident prevention.	10	KTUDec2020
16	Explain in detail different clinical tests conducted on blood.	10	KTUSept2020
17	Explain physiological effects of electric currents and write brief notes on various susceptibility parameters.	5	KTUMay2019
18	a)Write short note on infant incubator b) Draw the block diagram of infant incubator and explain	5	KTUJan2022
19	Discuss the principle and application of diathermy.	5	KTUJan2022
20	What are the chemical blood tests carried out in a clinical laboratory	5	KTUJan2022
21	Explain artificial kidney with neat sketches	10	KTUJan2022
22	What are the different methods of accident prevention in hospitals?	5	KTUJan2022
23	Discuss the need for ventilators.	5	KTUJan2022

HUT 310: MANAGEMENT FOR ENGINEERS
MODULE 1

Sl No	Question		Marks
1	Comment on true nature of management. Is it science or art?	Model Qn	3
2	Explain System approach to management. Describe roles of a manager	Model Qn, Dec 2021 Dec 2023	10 4
3	What are the different levels of management? What is the importance of delegation in management	Dec 2021	3
4	Explain Task and Responsibilities of a professional Manager.	Dec 2021	8
5	Discuss any three skills of management	June 2022 Dec 2023	3
6	Explain contingency Approach in Management	June 2023	3
7	Explain in detail about 14 principles of Henry Fayol's Administrative Management	June 2023	14
8	"Effectiveness and efficiency balance is a main feature of management". Summarize. "Management is a composite and continuous process". Express your views.	Dec 2023	6
9	Discuss the aspects in which the neoclassical theory improved the classical theory.	Dec 2023	3
10	Explain how the managerial functions interrelates with each other	Dec 2023	8

MODULE 2

1	What are planning premises, explain the classification of planning premises. Explain the process of communication.	Model Qn	10
2	a)Explain 3 motivational theories b) Describe Managerial grid	Model Qn, June 2023	9 5
3	Explain the vision, mission, goals, strategy, programmes, policy, objective and procedures of an organisation with suitable examples.	Dec 2021 Model Qn Dec 2023	8
4	Differentiate between strategic and tactical decisions.	Dec 2021	6
5	a) Illustrate the different types of organisation structures. b) Explain the factors governing the selection of organisation structures.	Dec 2021 June 2023	8 6
6	Differentiate positive and negative motivation	June 2022	3
7	What is transactional leadership Explain about dimensions of leadership	June 2022 June 2023	8
8	Explain the concept of span of control in an organisation. What are the factors governing the selection of span of management. Differentiate narrow and wide spans of management.	June 2022 Dec 2022 Dec 2023	12
9	Enumerate the advantages of functional organisation. List the features of management process	Dec 2023	6
10	Define the terms Authority, Responsibility and Accountability. Also, list the sources of authority.	Dec 2023	8

MODULE 3

1	Explain the type of decisions	Model Qn Paper	3
2	Describe the economic man model	Model Qn Paper	3
3	a) Modern forest management uses controlled fires to reduce fire hazards and to simulate new forest growth.Management has the option to postpone or plan a burning.In a specific forest tract,if burning is postponed a general administrative cost of Rs, 300 is incurred .I a controlled burning is planned,there is a 50% chance that good weather will prevail and burning will cost Rs.3200.The results of burning may be either successful with probability 0.6 or marginal with probability 0.4.Successful excitation will result in an estimated benefit of Rs.6000 and marginal execution will provide 3000/- in benefits. i) Develop a decision tree for the problem. ii)Analyse the decision tree and determine the optimal course of action. b) Student tuition at ABC university is $100 per semester credit hour. The education dept. supplements the university revenue by matching student tuition,$ per $.Average class size for a typical 3 credit course is 50 students.Labour cost is $ 4000 per class,material cost is $ 20 per student and overhead cost is $25000?- per class. a) Determine the total factor productivity b) Instructors deliver lectures 14 hr per week and the semester lasts for 15 weeks. What is the labour productivity?	Model Qn Paper	14
4	a)The producer of an apple crates company produces 270 crates per 100 logs with his current equipment. He currently purchases 100 logs per day, and each log required 3 labour hours to process. He believes that he can hire a professional buyer who can buy a better quality log at the same cost. If this is the case, he increases his production to 290 crates per 100 logs. His labour hours will increase by 8 hours per day. What will be the impact on productivity (measured in crates per labour-hour) if the buyer is hired? What is the growth in productivity in this case? b) Explain decision making under uncertainty.	Dec 2022	10 4
5	a)A cell phone manufacturer has invented a 3D phone. The company wants to take decision whether to manufacture the phone, take royalty from another manufacturer, or sell rights of the invention and take a lump sum amount of ₹50,000. The profits associated and probability of these alternatives is given in the table below. Represent the problem as a decision tree and suggest a decision to maximise profits.	Dec 2022	7

<table>
<tr><td></td><td>
<table>
<tr><td rowspan="2">Demand</td><td colspan="2">Manufacture the phone</td><td colspan="2">Take royalty</td></tr>
<tr><td>Probability</td><td>Profit (₹)</td><td>Probability</td><td>Profit (₹)</td></tr>
<tr><td>High</td><td>0.25</td><td>200,000</td><td>0.25</td><td>60,000</td></tr>
<tr><td>Medium</td><td>0.4</td><td>50,000</td><td>0.4</td><td>40,000</td></tr>
<tr><td>Low</td><td>0.35</td><td>-10,000</td><td>0.35</td><td>20,000</td></tr>
</table>
b) Explain the different models of decision-making behaviour</td><td></td><td>4</td></tr>
<tr><td>6</td><td>How can we improve the productivity of an organisation?</td><td>Dec 2022
June 2023</td><td>3</td></tr>
<tr><td>7</td><td>List out the steps in rational decision-making.
Explain programmed and non programmed decisions</td><td>Dec 2022
Dec 2023</td><td>3</td></tr>
<tr><td>8</td><td>Discuss decision making under risk</td><td>June 2022</td><td>3</td></tr>
<tr><td>9</td><td>A food products company is planning the introduction of a revolutionary new product with new packing to replace the existing product at much higher price (S1) or a moderate change in the composition of the existing product with a new packaging at a small increase in price(S2) or a small change in the composition of the existing except the word, ‘New’ with a negligible increase in the price (S3). The three possible states of nature of events are (i) high increase in sales (N1) (ii) no change in sales (N2) (iii) decrease in sales (N3). The marketing department of the company worked out the payoffs in terms of yearly new profits for each of the strategies on these events. This is represented in the following table.
Which strategy should the executive concernmed choose on the basis of
(a) Maximin Criterion
(b) Maximax Criterion
(c)Minimax regret Criterion
(d)Laplace criterion
<table>
<tr><td rowspan="2"></td><td colspan="3">Pay offs</td></tr>
<tr><td colspan="3">States of nature</td></tr>
<tr><td>Strategies</td><td>N1</td><td>N2</td><td>N3</td></tr>
<tr><td>S1</td><td>700</td><td>300</td><td>150</td></tr>
<tr><td>S2</td><td>500</td><td>450</td><td>0</td></tr>
<tr><td>S3</td><td>300</td><td>300</td><td>300</td></tr>
</table></td><td>Dec 2023</td><td>10</td></tr>
<tr><td>10</td><td>Explain in detail different productivity measurement indices.</td><td>Dec 2023</td><td>14</td></tr>
</table>

MODULE 4

<table>
<tr><td>1</td><td>Explain the concept of crashing and dummy activity</td><td>Model Qn Dec 2022</td><td>3</td></tr>
<tr><td>2</td><td>Differentiate qualitative and quantitative methods in forecasting</td><td>Model Qn</td><td>3</td></tr>
<tr><td>3</td><td>a) A project consists of 7 activities and the three time estimates are as follows:

<table><tr><th rowspan="2">Activities</th><th colspan="3">Duration in weeks</th></tr><tr><th>t_o</th><th>t_m</th><th>t_P</th></tr><tr><td>A</td><td>2</td><td>6</td><td>10</td></tr><tr><td>B</td><td>4</td><td>6</td><td>12</td></tr><tr><td>C</td><td>2</td><td>3</td><td>4</td></tr><tr><td>D</td><td>2</td><td>4</td><td>6</td></tr><tr><td>E</td><td>3</td><td>6</td><td>9</td></tr><tr><td>F</td><td>6</td><td>10</td><td>14</td></tr><tr><td>G</td><td>1</td><td>3</td><td>5</td></tr></table>
The sequence of activities is as follows: · Activities A and B start at the beginning of the project. · When A is completed C and D start. · Ecan start when B and D are finished.
F can start when B, C and D are completed and is the final activity. G can start when F is finished and is the final activity. i. What is the expected time of the duration of the project? ii. Identify the critical path of the project. iii. Calculate the probability that the project will be completed in 23 weeks.
b) Write notes on Fulkerson’s rule of numbering events.</td><td>Dec 2022 Dec 2023</td><td>10

4</td></tr>
<tr><td>4</td><td>a)The following table shows the precedence requirements, normal and crash times, and normal and crash costs for a project. The indirect costs are ₹ 70/day.</td><td>Dec 2022</td><td>10</td></tr>
</table>

	<table><tr><th rowspan="2">Activity</th><th colspan="2">Required Time (days)</th><th colspan="2">Cost (₹)</th></tr><tr><th>Normal</th><th>Crash</th><th>Normal</th><th>Crash</th></tr><tr><td>1-2</td><td>8</td><td>6</td><td>100</td><td>200</td></tr><tr><td>1-3</td><td>4</td><td>2</td><td>150</td><td>350</td></tr><tr><td>2-4</td><td>2</td><td>1</td><td>50</td><td>90</td></tr><tr><td>2-5</td><td>10</td><td>5</td><td>100</td><td>400</td></tr><tr><td>3-4</td><td>5</td><td>1</td><td>100</td><td>200</td></tr><tr><td>4-5</td><td>3</td><td>1</td><td>80</td><td>100</td></tr></table> i. Draw the network. ii. Determine the critical path. iii. Determine the optimal duration and the associated cost after crashing. b) Differentiate between activity and event in a project network.		
5	What are the rules for constructing a project network	June 2022	3
6	What is an event in a project network? Using sketches, explain merge and burst events What are the different networking components	June 2022 Dec 2023	3
7	Using beta distribution, explain the three time estimates associated with the PERT.	June 2022	4
8	Following details are available regarding a project: <table><tr><th>Activity</th><th>Predecessor activity</th><th>Duration(weeks)</th></tr><tr><td>A</td><td>-</td><td>3</td></tr><tr><td>B</td><td>A</td><td>5</td></tr><tr><td>C</td><td>A</td><td>7</td></tr><tr><td>D</td><td>B</td><td>10</td></tr><tr><td>E</td><td>C</td><td>5</td></tr><tr><td>F</td><td>D,E</td><td>4</td></tr></table> a) Draw network diagram b) Calculate EST,EFT,LST,LFT and slack of the project network c) Find critical path and project duration	June 2022	10
9	Consider the project network with data given in the following table. <table><tr><th rowspan="2">Activity</th><th rowspan="2">Predecessor(s)</th><th colspan="3">Time</th></tr><tr><th>Optimistic</th><th>Most likely</th><th>Pessimisti</th></tr><tr><td>A</td><td>-</td><td>4</td><td>6</td><td>8</td></tr><tr><td>B</td><td>A</td><td>5</td><td>7</td><td>15</td></tr><tr><td>C</td><td>A</td><td>4</td><td>8</td><td>12</td></tr><tr><td>D</td><td>B</td><td>15</td><td>20</td><td>25</td></tr><tr><td>E</td><td>B</td><td>10</td><td>18</td><td>26</td></tr><tr><td>F</td><td>C</td><td>8</td><td>9</td><td>16</td></tr><tr><td>G</td><td>E</td><td>4</td><td>8</td><td>12</td></tr><tr><td>H</td><td>D,F</td><td>1</td><td>2</td><td>3</td></tr></table>	June 2022 Dec 2023	10

	I	G,H	6	7	8		
	a) Construct an arrow diagram for the above data. Determine critical path and expected project completion time. b) Determine the probability that the project would be completed in 55 days						
10	Explain Activity-on-Arc(AOA) and Activity-on-Node(AON) in detail with suitable graphical representation.					Dec 2023	8

MODULE 5

1	"Human Resource Management policies and principles contribute to effectiveness, continuity and stability of the organization". Discuss	Dec 2022	10
2	What are intellectual property rights? Explain the business importance of patents. What is Corporate Social Responsibility	Dec 2022	7
3	Explain the various interrelationships between the following functional areas. (i) Production and Marketing (ii) Production and Finance (iii) Production and Personnel.	Dec 2022	7
4	Explain the process of market segmentation. How is the marketing mix related to market segmentation? Discuss the four P's of marketing mix	Dec 2022 Dec 2023	10
5	Operations management is the process of planning, organizing and controlling the activities of a production function". Explain.	Dec 2022 June 2023	12
6	Distinguish between the following. (i) Assets and Liabilities (ii) Production concept and Marketing concept (iii) Needs and Wants (iv) Design functions and Operational control functions	Dec 2022	4
7	Explain the entrepreneurial process. Illustrate any three types of entrepreneurships. Explain the different characteristics of a successful entrepreneur	Dec 2022, June 2022 June 2023 Dec 2023	14
8	a)Describe the significance of a business plan in a company. b)What is the financial budget? Describe any three types	June 2022 Dec 2023	6 8
9	Differentiate between recruitment and selection	Dec 2022 Dec 2023	3
10	"Financial Management is managing the finances through scientific decision making". Defend stating the different financial management functions.	Dec 2023	10