University ofMumbai

ExaminationsSummer2022

Program: **BE Electrical Engineering**
Curriculum Scheme: Rev 2019 'C' Scheme
Examination: SE Semester III
Course Code: **EEC301** and Course Name: **Engineering Mathematics III**

Time:2-hour30minutes Max.Marks:80

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Q1.	**Choosethecorrectoption forfollowingquestions.AlltheQuestions arecompulsoryandcarry equalmarks**
1.	Find Laplace transform of e^{5t}
OptionA:	$\frac{1}{s-5}$
OptionB:	$\frac{1}{s+5t}$
OptionC:	$\frac{5}{s+5t}$
OptionD:	$\frac{1}{s+5}$
2.	Find $L[t \sin at]$
OptionA:	$\frac{2s}{(s^2+a^2)^2}$
OptionB:	$\frac{2as}{(s^2+a^2)^2}$
OptionC:	$\frac{1}{(s^2+a^2)^2}$
OptionD:	None of the above
3.	In Fourier series of $f(x) = xcosx$ in $(-\pi, \pi)$. The value of a_n is
OptionA:	0
OptionB:	$\frac{-1}{2}$
OptionC:	$\frac{(-1)^n}{n^2-1}$
OptionD:	$\frac{1}{n^2-1}$
4.	f (x) = $e^{-\lvert x \rvert}$ in the interval $(-\pi, \pi)$ is
OptionA:	Both even and odd function
OptionB:	Neither even nor odd
OptionC:	Odd function
OptionD:	Even function

5.	Which of the following functions is NOT analytic
OptionA:	Sinhz
OptionB:	Cosz
OptionC:	$\bar{z}$
OptionD:	$z^2 + z$
6.	Find the value of a if $F = (x - 2z)i + (y - 5x)j + (az + 2x)k$ is solenoidal
OptionA:	$a = 2$
OptionB:	$a = -2$
OptionC:	$a = -4$
OptionD:	$a = 4$
7.	The divergence and curl of $\bar{F} = x^2 z\, i - 2y^3 z^3\, j + xy^2 z^2 k$ at (1, -1, 1) is
OptionA:	div$\bar{F}$=0 , curl $\bar{F}$=5
OptionB:	div$\bar{F}$=2, curl $\bar{F}$=8
OptionC:	div$\bar{F}$=-2, curl $\bar{F}$= -8
OptionD:	div$\bar{F}$=0 , curl $\bar{F}$=0
8.	If A = $\begin{bmatrix} 2 & 0 & 0 \\ 3 & -1 & 0 \\ -4 & 5 & 0 \end{bmatrix}$ Find Eigen Values of $A^2 + 2A + I$
OptionA:	9,0,0
OptionB:	9,0,1
OptionC:	3,0,0
OptionD:	9,4,1
9.	A function f(t) is periodic with period 2π if
OptionA:	$f(t + 2\pi) = 0$
OptionB:	$f(t + 2\pi) = 2\pi$
OptionC:	$f(t + 2\pi) = f(2\pi)$
OptionD:	$f(t + 2\pi) = f(t)$
10	Find $L^{-1}\left[\frac{s+2}{s^2+4s+13}\right]$
OptionA:	e^{2t} cos 3t
OptionB:	e^{2t} sin 3 t
OptionC:	e^{-2t} cos 3t
OptionD:	e^{-2t} sin 3t

Q2. **(20 Marks Each)**	**Solve any Four out of Six5 marks each**
A	*Evaluate* $\int_0^\infty \left(\frac{\cos at - \cos bt}{t}\right) dt$
B	Find $L^{-1}\left[tan^{-1}\left(\frac{a}{s}\right)\right]$
C	*Obtain the half range Fourier sine series expansion for* $f(x) = x \sin x$ *in* $(0, \pi)$
D	*Find the analytic function* $f(z)$ *whose real part is* $x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$

E	*Find the eigen values and eigen vector for* $A = \begin{bmatrix} 2 & 1 & 1 \\ 2 & 3 & 2 \\ 3 & 3 & 4 \end{bmatrix}$
F	Show that $\bar{F} = (y^2 - z^2 + 3yz - 2x)i + (3xz + 2xy)j + (3xy - 2xz + 2z)k$ is both irrotational and solenoidal.
Q3. **(20 Marks Each)**	**Solve any Four out of Six5 marks each**
A	*Find* $L\left[\int_0^t e^{-2u} cos^2 u \, du\right]$
B	*Find the inverse Laplace transform by using convolution theorem* $\frac{1}{(s^2+4s+13)^2}$
C	*Obtain the Fourier series for* $f(x) = x$ *in* $(0,2\pi)$
D	*Obtain the orthogonal trajectories for the family of curves* $e^{-x}\, cosy + xy = c$ where c is the real constant in the xy-plane.
E	*Show that* $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ *satisfies Cayley-Hamilton theorem. Hence find* A^{-1}
F	Evaluate by using Green's theorem $\int_c (3x^2 - 8y^2)dx + (4y - 6xy)dy$, where C is the closed region bounded by $y = \sqrt{x}$ and $y = x$
Q4. **(20 Marks Each)**	**Solve any Four out of Six** **5 marks each**
A	*Evaluate* $\int_0^\infty e^{-t} \int_0^t \left(\frac{\sin u}{u}\right) du \, dt$
B	$L^{-1}\left[log\left(1 + \frac{4}{s^2}\right)\right]$
C	*Obtain the Fourier series for* x^3 *in* $(-\pi, \pi)$
D	*Find the analytic function* $f(z)$ *whose imaginary part is* $e^x(x\, siny + y\, cosy)$
E	*If* $A = \begin{bmatrix} 2 & 3 \\ -3 & -4 \end{bmatrix}$ *then find* A^{50}
F	Use Stoke's Theorem to evaluate $\int_c \bar{F} d\bar{r}$ where $\bar{F} = x^2 I + xy\, j$ and C is the boundary of the rectangle x=0, y=0,x=a,y=b

University of Mumbai
Examination First Half 2022

Program: **Electrical Engineering**

Curriculum Scheme: Rev 2019 C Scheme

Examination: SE Semester III

Course Code: EEC303 and Course Name: Fundamentals of Electrical Machines & Measurements

Time: Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Laminated cores, in electrical machines, are used to reduce----------
Option A:	Copper loss
Option B:	Eddy current loss
Option C:	Hysteresis loss
Option D:	All of the above
2.	For a linear electromagnetic circuit, which of the following statement is true?
Option A:	Field energy is less than the Co-energy
Option B:	Field energy is equal to the Co-energy
Option C:	Field energy is greater than the Co-energy
Option D:	Co-energy is zero
3.	Ward-Leonard control is basically a _____ control method.
Option A:	Field control.
Option B:	Armature resistance control.
Option C:	Armature voltage control.
Option D:	Field diverter control.
4.	The linear variable differential transducer is
Option A:	Inductive transducer
Option B:	Non-inductive transducer
Option C:	Capacitive transducer
Option D:	Resistive transducer
5.	Hall Effect transducer can be used to measure _____
Option A:	Magnetic field
Option B:	Angular displacement
Option C:	Linear displacement
Option D:	All of the mentioned
6.	What is the resolution of a 3 digit display on 1 V range?
Option A:	1 V
Option B:	0.1 V
Option C:	0.01 V
Option D:	0.001 V
7.	Successive approximation type DVM is based on the principle of _____
Option A:	acceleration of an object
Option B:	weight of an object
Option C:	velocity of an object

Option D:	momentum of an object
8.	When a current of 5A flows through a coil of linear magnetic circuit, it has flux linkages of 2.4 wb-turns. What is the energy stored in the magnetic field of this coil in Joules?
Option A:	12
Option B:	6
Option C:	1.2
Option D:	2.4
9.	Which of the following types of damping is used in a permanent magnet moving coil instrument?
Option A:	Air friction damping
Option B:	Eddy current damping
Option C:	Electromagnetic damping
Option D:	Fluid friction damping
10.	In digital frequency meter, the schmitt trigger is used for
Option A:	sinusoidal waveform into rectangular pulses
Option B:	scaling of sinusoidal waveforms
Option C:	providing time base
Option D:	none of the mentionned

Q2	**Solve any Two Questions out of Three** **10 marks each**
A	Derive torque equation of Doubly excited system.
B	Draw and explain Electrodynamometer type instruments.
C	Explain with neat diagram Hopkinson's test.

Q3	**Solve any Two Questions out of Three** **10 marks each**
A	Derive torque equation for Moving Iron Instrument.
B	A 220V dc shunt motor having an armature resistance of 0.25Ω carries an armature current of 50A and runs at 600 rpm If the flux is reduced by 10% by field regulator. Find the speed assuming load remains the same.
C	Draw and explain Kelvin's double bridge.

Q4	**Solve any Two Questions out of Three** **10 marks each**
A	Explain Ramp type digital voltmeter with block diagram.
B	Draw & explain characteristics of DC shunt motor.
C	What is potentiometer and explain its working with a neat diagram?

University of Mumbai
Examination 2022

Program: **BE Electrical Engineering**
Curriculum Scheme: Rev2019 (C-SCHEME)
Examination: Summer 2022/SE/Semester III

Course Code: **EEC304** and Course Name: **Electrical Power System-1**

Time: 2 hour 30 minutes Max. Marks: 80

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks.**
1.	In India ..... system is adopted for transmission of electric power.
Option A:	3-PHASE, 3 WIRE
Option B:	3-PHASE, 4 WIRE
Option C:	2-PHASE, 3 WIRE
Option D:	2-PHASE, 4 WIRE
2.	The higher the transmission voltage, the ..... is the conductor material required.
Option A:	More
Option B:	Lesser
Option C:	Medium
Option D:	Very large
3.	In a string of suspension insulators, if the unit nearest to the conductor breaks down, then other units will.....
Option A:	also breakdown
Option B:	remain intact
Option C:	no breakdown will occur
Option D:	Only the lowest string will breakdown.
4.	A 3-phase transmission line is being supported by three disc insulators. The potentials across top unit (i.e., near to the tower) and middle unit are 8 kV and 11 kV respectively. Calculate (i) the ratio of capacitance between pin and earth to the self-capacitance of each unit (K).
Option A:	0.375
Option B:	0.357
Option C:	0.753
Option D:	0.537
5.	The three conductors of a 3-phase line are arranged at the corners of a

	triangle of sides 2 m, 2·5 m and 4·5 m. Calculate the inductance per km of the line when the conductors are regularly transposed. The diameter of each conductor is 1·24 cm.
Option A:	1.274mH
Option B:	12.74mH
Option C:	1.724mH
Option D:	127.4mH
6.	Transmission lines are transposed to
Option A:	Reduce copper loss
Option B:	Reduce skin effect
Option C:	Prevent interference with neighbouring telephone lines
Option D:	Prevent short-circuit between any two lines
7.	When bundle conductors are used in place of single conductors, the effective inductance and capacitance will respectively
Option A:	Increase and decrease
Option B:	Decrease and increase
Option C:	Decrease and remain unaffected
Option D:	Remain unaffected and increase
8.	Aluminium is now most commonly used conductor in transmission line than copper because
Option A:	It is more conductive
Option B:	Its tensile strength is more
Option C:	It is costlier
Option D:	It is light in weight
9.	In transmission line, distributed constants are
Option A:	Resistance and shunt conductance only
Option B:	Resistance and inductance only
Option C:	Resistance, inductance and capacitance
Option D:	Resistance, inductance, capacitance and shunt conductance
10.	Which of the following generating plants have minimum operating costs.
Option A:	Diesel plant
Option B:	Nuclear Plant
Option C:	Thermal Plant
Option D:	Hydro-Electric Plant

Q2. (20 Marks Each)	**Solve any Two Questions out of Three** **10 marks each**
A	What are the different stages in the power system? Draw the single line representation of a power system.
B	Draw a neat labelled diagram of nuclear power plant and elaborate its operation in brief.
C	What is string efficiency? Elaborate the methods for improving string efficiency.

Q3 (20 Marks Each)	**Solve any Two Questions out of Three**	**10 marks each**
A	Derive the expression for capacitance of a three phase transmission line with unsymmetrical spacing between conductors.	
B	Using nominal π method , find the sending end voltage and voltage regulation of a 250 km, three phase, 50 Hz, transmission line delivering 25 MVA at 0.8pf lagging to a balanced load at 132 kV. The line conductors are spaced equilaterally 3 m apart. The conductor resistance is 0.11ohm/km and its effective diameter is 1.6 cm.	
C	Write a short note on 1. Soil Resistivity and 2. Measurement of earth resistance.	
Q4 (20 Marks Each)	**Solve any Two Questions out of Three**	**10 marks each**
A	What are the different methods of Neutral Grounding? Explain the features of solidly (effectively) grounded system and Resonant (Arc suppression coil) grounding.	
B	Enlist all types of cables and explain the constructional features of H type and SL type cables.	
C	What is per unit system? What are the advantages of per unit system?	

University of Mumbai

Examinations Summer 2022

Time: 2 hour 30 minutes Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Bipolar Junction Transistor
Option A:	Voltage controlled device
Option B:	Current controlled device
Option C:	Very high input impedance device
Option D:	None of the above
2.	The MOSFET stands for
Option A:	Metal oxidized selenium FET
Option B:	Metal oxide surface FET
Option C:	Metal oxide semiconductor FET
Option D:	Metal of surface FET
3.	An ideal operational amplifier has
Option A:	infinite output impedance
Option B:	zero input impedance
Option C:	infinite bandwidth
Option D:	All of the above
4.	What is the purpose of differential amplifier stage in internal circuit of Op-amp?
Option A:	Low gain to differential mode signal
Option B:	Cancel difference mode signal
Option C:	Low gain to common mode signal
Option D:	Cancel common mode signaI
5.	Zener diodes are also known as
Option A:	Voltage regulators
Option B:	Forward bias diode
Option C:	Breakdown diode
Option D:	None of the mentioned
6.	For common emitter configuration, which of the following is not the correct relation?
Option A:	$IC < IE$
Option B:	$IC = \beta IB$
Option C:	$IC = \alpha IE$
Option D:	$IC = IE$
7.	Which is not considered as a linear voltage regulator?
Option A:	Fixed output voltage regulator
Option B:	Adjustable output voltage regulator
Option C:	Switching regulator
Option D:	Special regulator
8.	An ideal op-amp requires infinite bandwidth because

Option A:	Signals can be amplified without attenuation
Option B:	Output common-mode noise voltage is zero
Option C:	Output voltage occurs simultaneously with input voltage changes
Option D:	Output can drive infinite number of device
9.	Which is not the internal circuit of operational amplifier?
Option A:	Differential amplifier
Option B:	Level translator
Option C:	Output driver
Option D:	Clamper
10.	How a perfect integration is achieved in op-amp?
Option A:	Infinite gain
Option B:	Low input impedance
Option C:	Low output impedance
Option D:	High CMRR

Q2. **(20 Marks Each)**	**Solve any Four out of Six** **5 marks each**
A	Draw output characteristics of BJT in CE configuration.
B	Explain Zener diode as a voltage regulator.
C	What is early effect in BJT?
D	List out the ideal characteristics of OPAMP?
E	Write down advantages of MOSFET.
F	What happens when pn junction diode is made forward bias, explain considering any suitable application

Q3. **(20 Marks Each)**	**Solve any Two Questions out of Three** **10 marks each**
A	What is DC load line ? Derive equation for DC load line and show Q-point on DC load line
B	Design a variable voltage regulator using LM 317 to produce output voltage of 10 volts.
C	What is a 555 IC draw and explain the functional block diagram?

Q4. **(20 Marks Each)**	
A	**Solve any Two** **5 marks each**
i.	Explain concept of virtual ground.
ii.	Explain Schottky diode.
iii.	Explain op-amp as window comparator.
B	**Solve any One** **10 marks each**
i.	Draw and explain Op-amp as inverting summing amplifier.
ii.	Explain Types of biasing circuits of MOSFET.