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10MAT31

Third Semester B.E. Degree Examination, June/July 2017
Engineering Mathematics - III

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Obtain Fourier series for the function f(x) given by

$$f(x) = \begin{cases} 1+\frac{2x}{\pi}, & -\pi \le x \le 0 \\ 1-\frac{2x}{\pi}, & 0 \le x \le \pi \end{cases}$$

Hence deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots\ldots=\frac{\pi^2}{8}$. **(06 Marks)**

b. Obtain Fourier half range Cosine series for the function $f(x) = x \sin x$ in $(0, \pi)$. Hence show that $\frac{1}{1.3}-\frac{1}{3.5}+\frac{1}{5.7}-\ldots\ldots\infty=\frac{\pi-2}{4}$. **(07 Marks)**

c. Obtain the constant term and the co-efficient of the first sine and cosine terms in the Fourier series of f(x) as given in the following table. **(07 Marks)**

x	0	1	2	3	4	5
f(x)	9	18	24	28	26	20

2 a. Find the Fourier transform of $e^{-a^2x^2}$, $a < 0$. Hence deduce that $e^{-x^2/2}$ is self reciprocal in respect of Fourier transform. **(06 Marks)**

b. Find the Fourier sine transform of $e^{-|x|}$. Hence show that

$$\int_0^\infty \frac{x \sin mx}{1+x^2}dx = \frac{\pi e^{-m}}{2}, m > 0.$$ **(07 Marks)**

c. Find the Fourier Cosine transform of $f(x) = \frac{1}{1+x^2}$. **(07 Marks)**

3 a. Obtain various possible solutions of the one dimensional Heat equation $\frac{\partial u}{\partial t} = c^2\frac{\partial^2 u}{\partial x^2}$ by the method of separation of variables. **(06 Marks)**

b. Obtain the D'Alembert's solution of the wave equation $\frac{\partial^2 u}{\partial t^2} = c^2\frac{\partial^2 u}{\partial x^2}$. Subject to the conditions $u(x, 0) = f(x)$ and $\frac{\partial u}{\partial t}(x,0) = 0$. **(07 Marks)**

c. Obtain various possible solutions of the two dimensional Laplace equation $u_{xx} + u_{yy} = 0$ by the method of separation of variables. **(07 Marks)**

4 a. Fit a parabola $y = ax^2 + bx + c$ to the following data : **(06 Marks)**

x	0	1	2	3	4	5
y	1	3	7	13	21	31

b. A dealer wishes to purchase a number of fans and sewing machines. He has only Rs 5,760 to invest and has space for at most 20 items. A fan and sewing machine cost Rs 360 and Rs 240 respectively. He can sell a fan at a profit of Rs 22 and sewing machine at a profit of Rs 18. Assuming that he can sell whatever he buys, how should he invest his money in order to maximize his profit? Translate the problem into LPP and solve it graphically. **(07 Marks)**

c. Use Simplex method to solve the following LPP

Minimize $Z = x_1 - 3x_2 + 3x_3$

Subject to $3x_1 - x_2 + 2x_3 \leq 7$

$2x_1 + 4x_2 \geq -12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

$x_1, x_2, x_3 \geq 0.$ **(07 Marks)**

PART – B

5 a. Using Newton – Raphson method, find the value of $\sqrt[3]{18}$ correct to 2 decimals, assuming 2.5 as the initial approximation. **(06 Marks)**

b. Apply Gauss – Seidal iteration method to solve the following equations :

$3x + 20y - z = -18$; $2x - 3y + 20z = 25$; $20x + y - 2z = 17$. **(07 Marks)**

c. Find the largest Eigen - value and the corresponding Eigen - vector for the matrix $\begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$ with initial approximation $[1\ 1\ 0]^T$. **(07 Marks)**

6 a. Determine f(x) as a polynomial in x for the following data by using Newton's divided difference formula. **(06 Marks)**

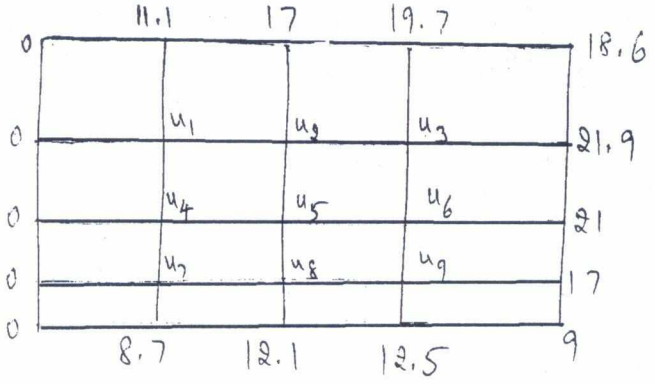
x	-4	-1	0	2	5
f(x)	1245	33	5	9	1335

b. From the data given in the following table, find the number of students who obtained i) less than 45 marks and ii) between 40 and 45 marks. **(07 Marks)**

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

c. Evaluate $\int_4^{5.2} \log_e x \, dx$ by Weddle's rule. **(07 Marks)**

7 a. Solve the Laplace equation $u_{xx} + u_{yy} = 0$, given that the boundary values for the following square mash. **(06 Marks)**



b. Evaluate the pivotal values of the equation $u_{tt} = 16u_{xx}$, taking h = 1 upto t = 1.25. The boundary conditions are $u(0,t) = u(5, t) = 0$, $u_t(x, 0) = 0$ and $u(x, 0) = x^2(5-x)$. **(07 Marks)**

c. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in $0 < x < 5$, $t \geq 0$, given that $u(x, 0) = 20$, $u(0, t) = 0$, $u(5, t) = 100$. Compute u for the time – step with h = 1 by Crank – Nicholson method. **(07 Marks)**

8 a. Find the Z – transform of the following :
i) $(n + 1)^2$ ii) $\sin(3n + 5)$ iii) n_{c_p} $(0 \leq p \leq n)$. **(06 Marks)**

b. If $u(z) = \frac{2z^2 + 3z + 12}{(z-1)^4}$. Find u_0, u_1, u_2, u_3. **(07 Marks)**

c. Solve $y_{n+2} + 4y_{n+1} + 3y_n = 3^n$ with $y_0 = 0$, $y_1 = 1$, using Z - transforms. **(07 Marks)**

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10ES32

Third Semester B.E. Degree Examination, June/July 2017
Analog Electronic Circuits

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. With respect to a semiconductor diode, explain the following:
(i) Reverse recovery time
(ii) Diffusion capacitance. **(06 Marks)**

b. Explain the working of full wave bridge rectifier and derive the expression for ripple factor and efficiency. **(08 Marks)**

c. Design an ideal clamper circuit to obtain the output waveform as shown in Fig. Q1 (c) for the given input. **(06 Marks)**

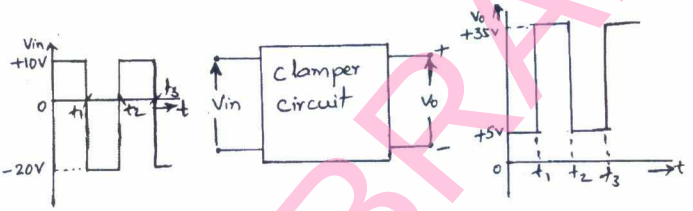

Fig. Q1 (c)

2 a. Explain with help of load line the effect of variation of V_{CC}, I_B on Q-point of a transistor. **(06 Marks)**

b. Derive the expression for stability factors for voltage divider bias circuit with respect to I_{CO}, V_{BE} and β. **(06 Marks)**

c. Determine the voltage V_{CE} and the current I_C for the voltage divider configuration shown in Fig. Q2 (c) **(08 Marks)**

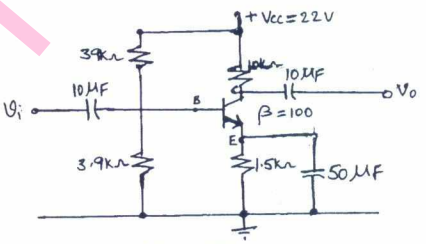

Fig. Q2 (c)

3 a. Draw the re-equivalent circuit of CE fixed bias configuration and derive the expression for Z_{in}, Z_O and A_V. **(10 Marks)**

b. What are the advantages of h-parameters? **(04 Marks)**

c. For the network shown in Fig. Q3 (c), determine r_e, Z_i, Z_o, A_v. **(06 Marks)**

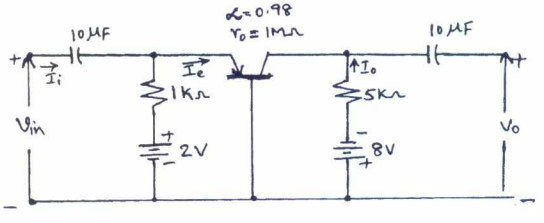

Fig. Q3 (c)

4 a. Obtain expression for Miller effect input and Miller effect output capacitance. **(06 Marks)**

b. Draw and discuss the effect of various capacitors on high frequency response. **(06 Marks)**

c. Determine the lower cutoff frequency for the voltage divider bias BJT amplifier with $C_S = 10\,\mu F, C_C = 1\,\mu F, C_E = 20\ \mu F$, $R_S = 1\ K\Omega$, $R_1 = 40\,K\Omega$, $R_2 = 10\,K\Omega$, $R_E = 2\ K\Omega$, $R_C = 4\ K\Omega$, $R_L = 2.2\ K\Omega$, $\beta = 100$, $r_0 = \infty\ \Omega$, $V_{CC} = 20V$ **(08 Marks)**

PART – B

5 a. Explain the important advantages of a negative feedback amplifier. **(04 Marks)**

b. Obtain expression for Z_{if} and Z_{of} for voltage series feedback amplifier. **(08 Marks)**

c. Why do we cascade amplifier? State the various method of cascading transistor amplifier. A given amplifier arrangements has the following voltage gains. $A_{V_1} = 10$, $A_{V_2} = 20$ and $A_{V_3} = 40$. What is the overall voltage gain? Also express each gain in dB and determine the total voltage gain in dB? **(08 Marks)**

6 a. With a neat circuit diagram, explain the operation of a transformer coupled class A power amplifier. **(06 Marks)**

b. Prove that the maximum conversion efficiency in class B power amplifier is 78.5%. **(08 Marks)**

c. A power amplifier has harmonic distortions $D_2 = 0.1$, $D_3 = 0.02$, $D_4 = 0.01$, the fundamental current $I_1 = 4$ Amps and $R_L = 8\ \Omega$. Calculate the total harmonic distortion, fundamental power and total power. **(06 Marks)**

7 a. State Barkhausen criteria for sustained oscillations apply this to a transistorized Weinbridge oscillator and explain its operation. **(10 Marks)**

b. Explain the working of BJT Colpitt's oscillator. **(06 Marks)**

c. Calculate the frequency of oscillations of a Colpitt's oscillator, L = 100 μH, $C_1 = 100$ pF, $C_2 = 1000$ pF. **(04 Marks)**

8 a. Derive expression for V_{GSQ}, I_{DQ}, V_{DS}, V_S, V_G and V_D for a self bias JFET circuit. **(10 Marks)**

b. Determine I_{DQ}, V_{GSQ} and V_{DS} for the P-channel JFET of Fig. Q8 (b). **(10 Marks)**

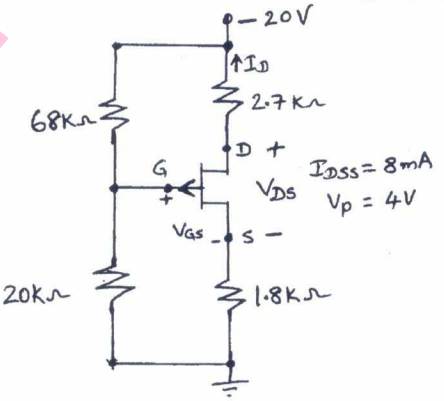

Fig. Q8 (b)

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10ES34

Third Semester B.E. Degree Examination, June/July 2017
Network Analysis

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Calculate the current through 2Ω resistor in the network shown in Fig. Q1 (a) by source transformation method. **(06 Marks)**

b. Compute the resistance across the terminals A and B of the network shown in Fig. Q1(b) by star delta transformation. **(06 Marks)**

c. Use mesh analysis to determine what value of V_2 in the network shown in Fig. Q1(c). Cause voltage V = 0 across 20Ω resistor. **(08 Marks)**

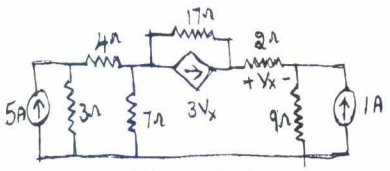

Fig. Q1(a)

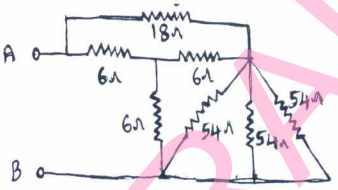

Fig. Q1(b)

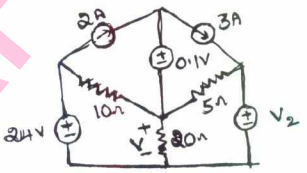

Fig. Q1(c)

2 a. Define with examples :
i) oriented graph ii) Tree iii) Cut set matrix iv) Tie set matrix. **(08 Marks)**

b. For the network shown in Fig. Q2(b) draw the graph. Select 2 and 4 as tree branches. Draw the tie set matrix. Write down the equilibrium equations with loop currents as variables. Solve these equations and find the various branch voltages and currents. The integers indicate branch numbers. Use matrix method. **(08 Marks)**

c. Draw the dual of the network shown in Fig. Q2(c). **(04 Marks)**

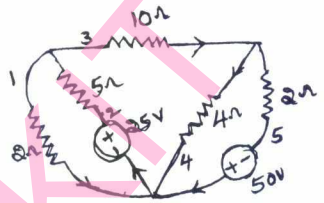

Fig. Q2(b)

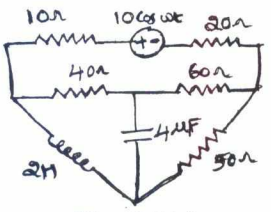

Fig. Q2(c)

3 a. Find V_a using superposition principle in the circuit shown in Fig. Q3(a). **(08 Marks)**

b. In the single current source circuit shown in Fig. Q3(b), find the voltge V_x. Interchange the current source and the resulting voltage V_x. Is the Reciprocity theorem verified? **(06 Marks)**

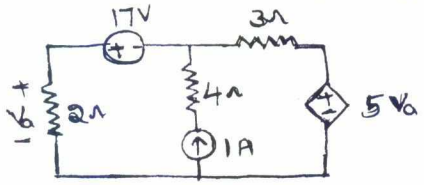

Fig. Q3(a)

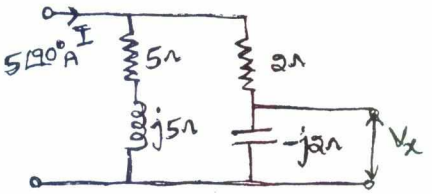

Fig. Q3(b)

c. State and explain Millman's theorem. **(06 Marks)**

4 a. For the network shown in Fig. Q4(a) , obtain the Thevinin's equivalent as seen from terminals p and q. **(08 Marks)**

b. Obtain Norton's equivalent circuit for the network shown in Fig. Q4(b). **(06 Marks)**

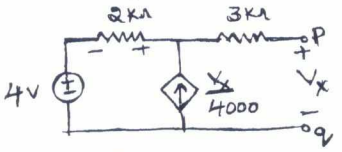

Fig. Q4(a)

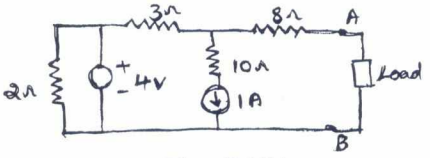

Fig. Q4(b)

c. Prove that an alternating voltage source transfers maximum power to a load when the load impedance is the conjugate of the source impedance. **(06 Marks)**

PART – B

5 a. Define quality factor and bandwidth. Also establish the relationship between them in a series resonance circuit. **(08 Marks)**

b. Show that resonant frequency of series resonance circuit is equal to the geometric mean of two half power frequencies. **(06 Marks)**

c. Find the value of R_L for which the circuit shown in Fig. Q5(c) is resonant. **(06 Marks)**

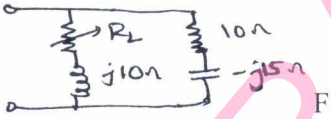

Fig. Q5(c)

6 a. Show that

i) The voltage of a capacitor cannot change instantaneously

ii) The current in an inductor cannot change instantaneously. **(10 Marks)**

b. In the circuit of Fig. Q6(b). Switch K is changed from 1 to 2 a t = 0 steady state having been attained in position 1. Find the values of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t = 0. **(10 Marks)**

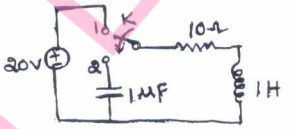

Fig. Q6(b)

7 a. State and prove i) Initial value theorem and ii) Final value theorem. **(10 Marks)**

b. Determine the response current i(t) in the circuit shown in Fig. Q7(b). Using Laplace transform. **(10 Marks)**

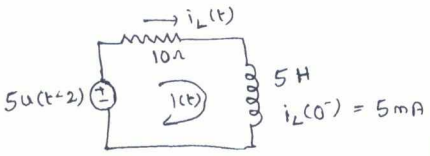

Fig. Q7(b)

8 a. Explain Z and Y parameters with equivalent circuit Also express Z parameters in terms of Y parameters. **(10 Marks)**

b. Obtain the Y parameters of the two port network shown in Fig. Q8(b). **(10 Marks)**

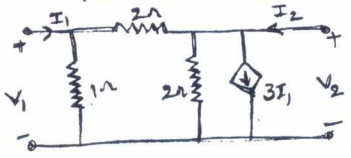

Fig. Q8(b)

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10EE35

Third Semester B.E. Degree Examination, June/July 2017
Electrical and Electronic Measurements and Instrumentation

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Derive the expression for the measurement of unknown resistance using Kelvin's double bridge. How the effect of connecting lead resistance is eliminated in this arrangement? **(10 Marks)**

b. The expression for the mean torque of an electro dynamometer type wattmeter may be written as : $T \alpha M^p E^q Z^t$, where M = mutual inductance between fixed and moving coils, E = applied voltage and Z = impedance of the load circuit. determine the values of p, q and t after deriving the dimensions of T, M, E and Z. **(10 Marks)**

2 a. Obtain the balance equation for Maxwell's inductance–capacitance bridge used for measurement of unknown inductance. Draw the phasor diagram at balance condition. **(10 Marks)**

b. The four arms of a bridge are :
Arm ab : an imperfect capacitor C_1 with an equivalent series resistance of r_1
Amr bc : a non inductive resistance R_3
Arm cd : a non inductive resistance R_4
Arm da : an imperfect capacitor C_2 with an equivalent series resistance of r_2 in series with a resistance R_2.
A supply of 450 Hz is given between terminal a and c and the detector is connected between b and d. At balance $R_2 = 4.8\Omega$, $R_3 = 200\Omega$, $R_4 = 2850\Omega$, $c_2 = 0.5\mu F$, $r_2 = 0.4\Omega$. Calculate the value of c_1 and r_1 and also the dissipating factor of this capacitor. **(10 Marks)**

3 a. Derive an expression for ratio and phase angle errors of C.T. with neat sketch. **(10 Marks)**

b. A CT has turns ratio 1 : 399 and is rated as 2000/5 A. The core loss component is 3A and magnetizing component is 8A, under full load conditions. Find the phase and ratio errors under full load conditions, if secondary circuit pf is 0.8 leading. **(10 Marks)**

4 a. Explain with the help of neat sketch, the construction, theory and working principle of an energy meter. **(10 Marks)**

b. With neat phasor diagram, explain the measurement of real power in 3ϕ circuits. **(08 Marks)**

c. What is creeping? **(02 Marks)**

PART – B

5 a. Explain with neat figure, Weston frequency meter. **(10 Marks)**

b. Explain with block diagram the true RMS voltmeter. **(08 Marks)**

c. What is Q meter? **(02 Marks)**

6 a. Explain with block diagram, the working of dual trace oscilloscope. **(10 Marks)**

b. Explain with block diagram, the working of digital storage oscilloscope. **(10 Marks)**

7 a. What is transducer? Briefly explain the procedure for selecting a transducer. **(06 Marks)**

b. Explain the principle of operating of LVDT in translating a linear motion into an electrical signal. **(08 Marks)**

c. Briefly explain photo conductive and photo voltaic cells. **(06 Marks)**

8 a. Explain with block diagram, the essential functional operations of a digital data acquisition system. Compare the digital and analog forms of data acquisition systems. **(08 Marks)**

b. Explain the working and application of an x-y recorder. **(08 Marks)**

c. Write a note on display devices. **(04 Marks)**

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10EE36

Third Semester B.E. Degree Examination, June/July 2017
Electric Power Generation

Time: 3 hrs. Max. Marks:100

Note: 1. *Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. *Assume missing data, if any suitably.*

PART – A

1 a. Discuss the importance of solar energy in the present energy crisis in the World. **(04 Marks)**
b. Explain the concept of co-generation also mention its advantages. **(08 Marks)**
c. With neat block diagram, explain the working of a geothermal power plant. **(08 Marks)**

2 a. With neat block diagram, mention the parts of diesel power plant. **(10 Marks)**
b. Explain the concept of Inter cooling in gas turbine power plant. **(04 Marks)**
c. Explain Bio-generation process also mention its advantages. **(06 Marks)**

3 a. What are the factors to be considered while selecting site for hydro – electric power plant. **(04 Marks)**
b. Calculate the average power in KW that can be generated in the hydro electric project from the following data : Catchment Area = 5×10^9 m^2 , Mean head 30mts , Annual Rain fall = 1.25 mts, Yield factor = 80% , Overall efficiency = 70% , Load factor 40%. Also calculate the maximum demand. **(08 Marks)**
c. With neat block diagram, explain the operation of Thermal power plant. **(08 Marks)**

4 a. With neat schematic diagram, explain the operation of Nuclear power plant. **(10 Marks)**
b. A thermal power plant spends Rs 25 lakh in one year as coal consumption. The coal has heating value of 5000 k cal per kg and costs Rs 500/ton. If thermal efficiency is 35% and electrical efficiency is 90%, find the average load on power plant. **(06 Marks)**
c. Explain PWR in nuclear power plant. **(04 Marks)**

PART – B

5 a. Define and explain the following terms :
i) Connected load ii) Maximum demand iii) Demand factor iv) Load factor v) Diversity factor. **(05 Marks)**
b. Get an expression for most economical power factor. **(07 Marks)**
c. An electric supply company having a maximum load of 50 MW generates 18×10^7 units/annum and the supply consumers have the aggregate demand of 75MW. The annual expenses including capital charges are as follows :
For Fuel = Rs 90 Lakhs ; Fixed charges concerning generation = Rs 28 lakhs
Fixed charges concerning Transmission and distribution = Rs 32 lakhs.
Assuming 90% fuel cost is essential to running charges and loss in transmission and distribution as 15% of KWhr generated, deduce 2 part tariff to find actual cost of supply to consumers. **(08 Marks)**

6 a. Explain the classification of substations according to the constructional features. **(06 Marks)**
b. Discuss the different kinds of bus – bar arrangements. **(06 Marks)**

c. A load on installation is 800KW, 0.8 pf lagging which works for 3000 hrs/year. The tariff is Rs 100/KVA + 20 paise/KW hr. If the power factor is improved to 0.9 by means of loss free capacitors costing Rs 60/KVAR, calculate the annual saving effected. Allow 10% / annum for interest and depreciation on capacitors. **(08 Marks)**

7 a. Explain how the current limiting reactors are classified on their location in power system. **(10 Marks)**

b. A 3 ϕ 20 MVA , 10 KV, Alternator has internal reactance of 5% and negligible resistance. Find the external reactance / phase to be connected in series with the alternator so that steady current on short circuit does not exceed 8 times the full load current. **(05 Marks)**

c. Discuss the advantages of grounding. **(05 Marks)**

8 Write short notes on :

a. Neutral grounding. **(05 Marks)**

b. Resistance grounding. **(05 Marks)**

c. Reactance grounding. **(05 Marks)**

d. Power factor improvement equipment. **(05 Marks)**

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MATDIP301

Third Semester B.E Degree Examination, June/July 2017
Advanced Mathematics – I

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Express : $\frac{1}{(2+i)^2}-\frac{1}{(2-i)^2}$ in the form of a + i b. **(07 Marks)**

b. Find the modulus and amplitude of the complex number $1-\cos\alpha+i\sin\alpha$. **(06 Marks)**

c. Express the complex number $\sqrt{3}+i$ in the polar form. **(07 Marks)**

2 a. Find the n^{th} derivative of log (ax + b). **(07 Marks)**

b. Find the n^{th} derivative of $\frac{x}{(x-1)(2x+3)}$. **(06 Marks)**

c. If $y = \sin^{-1} x$, prove that : $(1-x^2)y_{n+2}-(2n+1)x\,y_{n+1}-n^2y_n=0$. **(07 Marks)**

3 a. Using Taylor's theorem, expand sin x in power of $(x - \pi/2)$. **(07 Marks)**

b. Obtain the Maclaurin's series expansion of the function $\sqrt{1+\sin 2x}$ up to the term containing x^4. **(06 Marks)**

c. State and prove Euler's theorem. **(07 Marks)**

4 a. Find the total derivative of $z = xy^2 + x^2y$ where x = at, y = 2at, and also verify the result by direct substitution. **(07 Marks)**

b. If $u = f(y-z, z-x, x-y)$ prove that : $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}=0$. **(06 Marks)**

c. if $x = u(1 - v)$ and $y = uv$, find $J=\frac{\partial(x,y)}{\partial(u,v)}$ and $J'=\frac{\partial(u,v)}{\partial(x,y)}$ and also verify $J\cdot J' = 1$. **(07 Marks)**

5 a. Obtain the reduction formula for $\int\cos^n x\cdot dx$. **(07 Marks)**

b. Evaluate : $\int_0^2\frac{x^4}{\sqrt{4-x^2}}\cdot dx$. **(06 Marks)**

c. Evaluate : $\int_1^2\int_1^3 xy^2\,dx\,dy$. **(07 Marks)**

6 a. Evaluate : $\int_0^1\int_0^{\sqrt{1-x^2}}\int_0^{\sqrt{1-x^2-y^2}} x\,y\,z\,dz\,dy\,dx$. **(07 Marks)**

b. Prove that $\Gamma\left(\frac{1}{2}\right)=\sqrt{\pi}$. **(06 Marks)**

c. Prove that $\beta(m,n)=\frac{\Gamma_m\Gamma_n}{\Gamma(m+n)}$. **(07 Marks)**

7 a. Solve : $\frac{dy}{dx} = e^{x-y} + x^2e^{-y}$. **(07 Marks)**

b. Solve $x^2y\,dx - (x^3 + y^3)\,dy = 0$. **(06 Marks)**

c. Solve $\frac{dy}{dx} + y\cot x = \cos x$. **(07 Marks)**

8 a. Solve : $\frac{d^2y}{dx^2} + \frac{4dy}{dx} + 4y = 0$. **(05 Marks)**

b. Solve $\frac{d^2y}{dx^2} - \frac{6dy}{dx} + 9y = 3e^{-4x}$. **(05 Marks)**

c. Solve : $y'' + 2y' + y = e^{-x} + \cos 2x$. **(05 Marks)**

d. Solve : $\frac{d^2y}{dx^2} - 4y = x\sin 2x$. **(05 Marks)**

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