Reg. No. :

B.E. / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS, MAY 2012

SECOND SEMESTER – (REGULATIONS 2004)

Common to Mech, Manuf, Industrial and Printing

EE 192 – ELECTRICAL ENGINEERING

Time : 3 hrs　　　　　　　　　　　　　　　　　　　　　　Max . Mark: 100

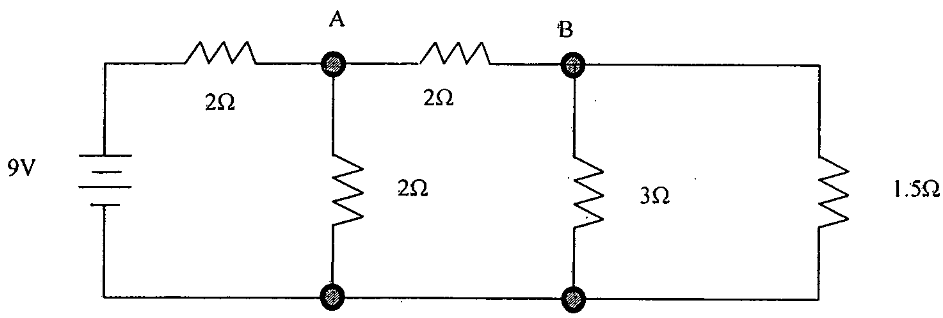
Answer All Questions

Part – A (10 x 2 = 20)

1. Calculate the resistance of copper conductor having a length of 2km and a cross-section of 22 mm^2. Assume the resistivity is 18 X 10^{-9} Ω-m.
2. State Ohm's law.
3. Explain complex operator 'j'.
4. Define (a) Kirchhoff's current law, (b) Kirchhoff's voltage law.
5. State the basic parts of a DC machine.
6. Write down the EMF equation for DC generator.
7. Name any two materials with which brushes are made.
8. Name any three of the types of Electrical instruments.
9. Write down the advantages of moving iron instruments.
10. Explain about the disadvantages of Dynamometer type wattmeter.

PART – B (5*16= 80)

11. Write the equations based on Kirchhoff's laws and solve for the branch voltages and currents. Numbers on the resistors are their resistances in ohms.



ii. In the table given below, the values of y are consecutive terms of a series of which 23.6 is the 6th term. Find the first and tenth terms of the series:

x	3	4	5	6	7	8	9
y	4.8	8.4	14.5	23.6	36.2	52.8	73.9

(8)

12. (a) i. Use Gauss-Jordan method to find the inverse of the matrix $\begin{pmatrix} 2 & 1 & 2 \\ 2 & 2 & 1 \\ 1 & 2 & 2 \end{pmatrix}$. (8)

ii. Find the largest eigen-value correct to three decimal places of the matrix $\begin{pmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$ by power method, What is the corresponding eigen-vector? (8)

(Or)

(b) i. Solve the equations $83x + 11y - 4z = 95$; $7x + 52y + 13z = 104$; $3x + 8y + 29z = 71$ by Gauss-Seidal method correct to three decimal places. (8)

ii. Using Jacobi's method, find all the eigen values and the eigen vectors of the matrix $\begin{pmatrix} 4 & 1 & 1 \\ 1 & 1 & 2 \\ 1 & 2 & 1 \end{pmatrix}$. (8)

13. (a) i. Find the first two derivatives of $x^{1/3}$ at $x = 56$ given the table below:

x	50	51	52	53	54	55	56
$y = x^{1/3}$	3.6840	3.7084	3.7325	3.7563	3.7798	3.8030	3.8259

(8)

ii. Apply Romberg's method to evaluate $\int_4^{5.2} \log x dx$, given that

x	4.0	4.2	4.4	4.6	4.8	5.0	5.2
$\log_e x$	1.3863	1.4351	1.4816	1.5260	1.5686	1.6094	1.6486

(8)

(Or)

(b) i. Evaluate $\int_{-3}^{3} x^4 dx$ by Trapezoidal and Simpson's $3/8^{th}$ rules with $h = 1$. (8)

ii. Using Simpson's $1/3^{rd}$ rule evaluate $\int_0^{\pi/2}\int_0^{\pi/2} \sqrt{\sin(x+y)}dxdy$, taking $h = k = \pi/4$. (8)

14) (a) (i) Two random process $X(t)$ and $Y(t)$ are defined as $X(t) = 3\cos(\omega t + \theta)$ and $Y(t) = 2\cos(\omega t + \varphi)$, where $\varphi = \theta - \frac{\pi}{2}$ and $\theta$is a uniform distributed in the interval $(0,2\pi)$. Verify that $|R_{XY}(\tau) \leq \sqrt{R_{XX}(0)R_{YY}(0)}$. (8)

(ii) If $X(t) = A\sin(wt + \theta)$ if A and w are constants and θ is uniformly distributed random variable on $(-\pi, \pi)$, find the auto correlation function of $Y(t) = X^2(t)$. (8)

(OR)

(b) (i) The power spectral density of a wide sense stationary process is given by $S(\omega) = \begin{cases} \frac{b}{a}(a - |\omega|), |\omega| \leq a \\ 0, \qquad |\omega| > a \end{cases}$, find the auto correlation function and power of the process. (8)

(ii) Find the power spectral density of the process $Y(t) = X(t)\cos(2\pi\omega t + \theta)$, where $X(t)$ is a WSS process and θ is uniformly distributed random variable over $(0,2\,\pi)$ and independent of $X(t)$. (8)

15) (a) (i) Assume a random process $X(t)$ is given as input to a system with transfer function $H(f) = 1, -W < f < W$. Find the output correlation function assuming the autocorrelation of input process as $\frac{\eta}{2}\delta(\tau)$. (8)

(ii) A circuit has an impulse response given by $h(t) = \begin{cases} \frac{1}{T}, 0 \leq t \leq T \\ 0, otherwise \end{cases}$. Evaluate $S_{YY}(\omega)$ in terms of $S_{XX}(\omega)$. (8)

(OR)

(b) (i) A linear system is described by the impulse response $h(t) = \left\{\frac{1}{RC} e^{-\frac{t}{RC}}\right.$. Assume an input signal whose autocorrelation function is $B\delta(\tau)$. Find the autocorrelation and power of the output. (8)

(ii) If $Y(t)$ is the output process when an input process $X(t)$ is applied to an linear time invariant system with impulse response $h(t)$, then prove that the power spectral desnity of $Y(t)$ is $S_{YY}(\omega) = |H(\omega)|^2 S_{XX}(\omega)$, where $S_{XX}(\omega)$ is the power spectral density of $X(t)$ and $H(\omega)$ is the system transfer function. (8)

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