OR

Find the eigen values of A and using Cayley - Hamilton theorem, find A^n (n is a positive integer); given that

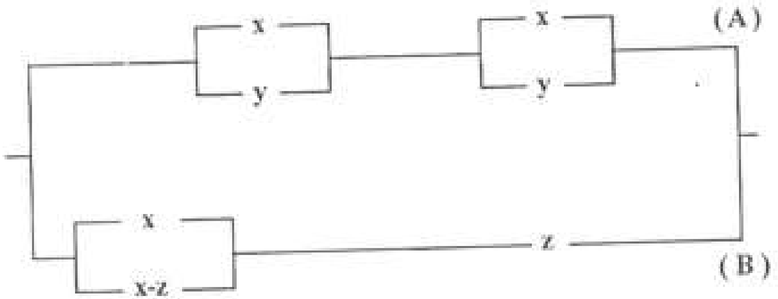
$A=\begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$. 7

Unit - V

5. a) What do you mean by logical equivalence and prove that the statement $(p \vee q) \wedge (\sim p \wedge \sim q)$ is a contradiction. 2

b) For a simple graph of n vertices, the number of edges is $\frac{1}{2}n(n-1)$. 2

c) Simplify the following circuit 3



d) A simple graph with n vertices and k components can have at most $\frac{(n-k)(n-K+1)}{2}$ edges. 7

OR

Express the following functions into disjunctive normal form $f(x, y, z) = x.y' + x.z + x.y$. 7

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Total No. of Questions : 5] *[Total No. of Printed Pages : 4*

Roll No ....

BE - 102

B.E. I & II Semester

Examination, June 2014

Engineering Mathematics-I

Time : Three Hours

Maximum Marks : 70

Note : i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

a) Expand $\log \frac{1+x}{1-x}$ in powers of x using Maclaurin's theorem. 2

b) Define homogeneous functions and composite function and establish the Euler's theorem on homogeneous function. 2

c) Find the extreme values of the function $x^3 + y^3 - 3axy$. 3

d) If the sides and angles of a triangle ABC vary in such a way that its circum radius remains constant, prove that

 PTO

$$\frac{da}{\cos A}+\frac{db}{\cos B}+\frac{dc}{\cos C}=0.$$ 7

OR

Prove that the radius of curvature for the catenary $Y=c\cosh\left(x/c\right)$ is equal to the portion of the normal intercepted between the curve and the x-axis and that it varies as the square of the ordinate. 7

Unit - II

2. a) Define Gamma function and Beta function and also establish the symmetry of Beta function. 2

b) Evaluate the following integral by changing the order of integration $\int_0^1\int_{e^x}^{e}\frac{dydx}{\log y}$ 2

c) Evaluate by definition of definite integral as the limit of a sum $\int_a^b \sin x\,dx$. 3

d) Find the volume bounded by the cylinder $x^2+y^2=4$ and the plans $y+z=4$ and $z=0$. 7

OR

Prove that 7

$$\lim_{n\to\infty}\left[\left(1+1^2/n^2\right)\left(1+2^2/n^2\right)\left(1+3^2/n^2\right)\cdots\left(1+n^2/n^2\right)\right]^{1/n}=2e^{\left(\frac{\pi-4}{2}\right)}$$

Unit - III

3. a) Define the order and degree of a differential equation with one example also explain that the elimination of n arbitary constants from an equation leads us to which order derivative and hence a differential equation of which order. 2

b) Solve $-ydx+xdy=\sqrt{x^2+y^2}\,dx$. 2

c) A bacterial population β is known to have a rate of growth α to β itself. If between noon and 2 pm the population triples, at what time, no controls being exerted should β become 100 times what it was at noon. 3

d) Solve $x^3\frac{d^3y}{dx^3}+3x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+y=x+\log x$. 7

OR

Solve the following differential equation by using the method of variation of parameters

$$\frac{d^2y}{dx^2}-2\frac{dy}{dx}+2y=e^x\tan x$$ 7

Unit - IV

4. a) Determine the rank of the following matrix

$$\begin{bmatrix}4 & 2 & 3\\ 8 & 4 & 6\\ -2 & -1 & -1.5\end{bmatrix}.$$ 2

b) Solve the system of equations using matrix method. 2

$$x+3y-2z=0$$
$$2x-y+4z=0$$
$$x-11y+14z=0$$

c) If A is a non-singular matrix, prove that the eigen values of A^{-1} are the reciprocals of the eigen values of A. 3

d) Find the eigen values and eigen vectors of the matrix

$$A=\begin{bmatrix}-2 & 2 & -3\\ 2 & 1 & -6\\ -1 & -2 & 0\end{bmatrix}.$$ 7