SE. Electrical Sem-IV (R) May 2018

SE Sem-Iv (choice based) Electrical

Sub - AM IV

Q.P. Code: 37579

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11/05/2018

Duration – 3 Hours **Total Marks : 80**

(1) N.B.:-Question no 1 is compulsory.
(2) Attempt any THREE questions out of remaining FIVE questions.

Q.1) a) Find the extremal of the functional $\int_0^{\pi/2}(y'^2 - y^2 + 2xy)\,dx$ with y(0)=0 and $y\left(\frac{\pi}{2}\right)=0$. (5)

b) A continuous random variable has probability density function $f(x) = kxe^{-\frac{x}{3}},\ x > 0$.Find 'k' and the mean. (5)

c) Find the minimal polynomial of $A=\begin{bmatrix}2 & -3 & 3\\ 0 & 3 & -1\\ 0 & -1 & 3\end{bmatrix}$ and check whether it is derogatory. (5)

d) Evaluate $\int_c \frac{z^2-2z+4}{z^2-1}dz$ where $c: |z-1| = 1$. (5)

Q.2 a) If $A=\begin{bmatrix}-1 & 4\\ 2 & 1\end{bmatrix}$, then prove that $3\tan A = A\tan 3$. (6)

b) Evaluate $\int_C \frac{\sin \pi z + \cos \pi z}{z^2+z}dz$; C is $|z|=4$. (6)

c) Let V={(x,y) / x, y∈ R, y>0}. Let (a,b), (c,d) ∈ V and α ∈ R. Define (a,b)+(c,d) = (a+c, b . d) and α (a, b)=(α a, b^{α}). Examine whether V is a Vector space. (8)

Q.3 a) Calculate the Karl Pearson's coefficient of correlation for the following bivariate series. (6)

X	28	45	40	38	35	33	40	32	36	33
Y	23	34	33	34	30	26	28	31	36	35

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b) Find the curve y=f(x) for which $\int_{x_1}^{x_2} y\sqrt{1+y'^2}\,dx$ is minimum (6)

subject to the constraint $\int_{x_1}^{x_2} \sqrt{1+y'^2}\,dx = l$.

c) Evaluate the integral $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+1)(x^2+4)}\,dx$ using Residue theorem. (8)

Q. 4 a) Let R^3 have the Euclidean inner product. Use Gram-Schmidt Process to transform the basis $\{u_1, u_2, u_3\}$ into orthonormal bases where $u_1=(1,1,1)$, $u_2=(0,1,1)$, $u_3=(0,0,1)$. (6)

b) Find the lines of regression for the following data (6)

x	65	66	67	67	68	69	70	72
y	67	68	65	66	72	72	69	71

c) A skilled typist.on routine work, kept a record of mistakes made per day during 300 working days. (8)

Mistakes per day	0	1	2	3	4	5	6
No of days	143	90	42	12	9	3	1

Fit a Poisson distribution to the above data and hence calculate the theoretical frequencies.

Q. 5 a) A random variable X has the following probability distribution (6)

X	0	1	2	3
P(X=x)	1/6	1/3	1/3	1/6

Compute i) Moment generating function about the origin, ii) first two raw moments and hence the variance.

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Find eigen values and eigen vectors of $A^3 - 2A + I$ if $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ (6)

Obtain the Laurent and Taylor's series for $\frac{z-1}{z^2-2z-3}$ indicating region of convergence. (8)

Using Rayleigh-Ritz method, solve the boundary value problem (6)
$I = \int_0^1 (xy + \frac{1}{2}y'^2)dx; 0 \le x \le 1$ Given y(0)=0 and also y(1)=0.

In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find mean and standard deviation of the distribution. (6)

If $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$. Show that for every integer n ≥ 3, (8)
$A^n = A^{n-2} + A^2 - I$. Hence find A^{50}

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