BNBUSIT3T5 / 02 / 2022

Duration : 2 Hours **Total Marks : 60**

Q. 1 **Attempt any four of the following** 16

a. Given that , $A = \begin{bmatrix} 0 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -1 & 1 \\ -3 & 2 & -1 \\ -2 & 1 & -1 \end{bmatrix}$

Verify that, i. $(AB)^* = B^*A^*$

b. State whether the following vectors are linearly dependent or are independent. If dependent find the relation between them $x_1 = (1,2,3)^T$,$x_2 = (3,-2,1)^T$, $x_3 = (1,-6,-5)^T$

c. Find the characteristic values and characteristic vector of the matrix $A = \begin{bmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$

d. Simplify ,

$$\frac{(cos3\theta + isin3\theta)^4 (cos5\theta - isin5\theta)^{4/5}}{(cos\frac{3}{2}\theta + isin\frac{3}{2}\theta)^{2/9} . (cos\frac{4}{5}\theta - isin\frac{4}{5}\theta)^{10}}$$ using De-mover's theorem

e. Find $z_1.z_2$ and z_1/z_2 where $z_1 = 1 - 2i$ and $z_2 = 3 - 4i$

f. Find the values of Log(-5) and log(1+i)

g. Solve the following homogeneous differential equation (x^2y)dx-$(x^3 + y^3)$dy=0

h. Solve $(2D^2 + 5D - 12)$ y=0

Q. 2 **Attempt any four of the following** 16

a. Find the complimentary function of the equation $(D^2 + 4D + 3)$ $y = e^x$

b. Find the particular integral of the equation $(D^3 - 2D^2 - 5D + 6)y = e^{4x}$

c. State and prove the second shifting theorem of Laplace transformation .

d. Find L{F(t)} for

i. $\frac{t}{2a}$ $sinhat$ ii. $t^2 \cos at$

e. Find the Laplace transformation of sinat and hence show that ,

$$\int_0^\infty \frac{sint}{t} .dt = \frac{\pi}{2}$$

f. Verify the convolution theorem for the pair of function , $f_1 = t$, $f_2 = e^{at}$.

g. Find the inverse Laplace transformation of the following function

$$\frac{s^2}{(s^2+a^2)^2}$$

h. Obtain the inverse Laplace transformation of the following functions.

$$\frac{s}{(s^2+a^2)^2}$$

Q. 3 **Attempt any four of the following** 16

a. Find the Laplace transformation of direct delta function.

b. Define periodic function also find Laplace transformation of the periodic function

c. Evaluate , $\int_0^1 \int_0^2 e^{x+y} \, dxdy$

d. Evaluate , $\int_0^2 \int_0^{1/4} xy.dx.dy$

e. Show that $\int_0^a x^6 (a^4 - x^4)^{1/4} dx \frac{\sqrt{2}}{128} a^8 \pi$

f. Prove that the beta function is symmetric.
i.e. $\beta(m,n) = \beta(n,m)$

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g. Find $\int_0^1 \int_0^2 \int_0^3 dz.dy.dx$

h. Change the order of integration in the following integral. $\int_0^1 \int_0^2 \sqrt{1-x^2}$ dy.dx where the region formed by y=x , x=1

Q. 4 **Attempt any Three of the following** **12**

a. Show that the matrix A= $\begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ satisfy its characteristic equation and hence determine A^{-1} .

b. Explain the properties of the matrices.

c. Solve x(1-x^2)$\frac{dy}{dx}$+($2x^2-1$)y=x^3

d. Solve using variable separable form $\frac{dy}{dx}=e^{x-2y}$

e. Obtained a Laplace transformation $\frac{d^2y}{dt^2}$ -3$\frac{dy}{dx}$+5y , given y(0)=2 and $y'(0)$= -4

f. Evaluate $\int_0^1 \int_0^{x^2} (x+2y^2)$dy.dx

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