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322351 (14)

BE (3rd Semester)

Examination, April-May, 2014

Branch : Computer Science & Engg.

MATHEMATICS - III (NEW)

Time Allowed : Three Hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all questions. Every question contains four parts. Part (a) of each equation is compulsory. Attempt any two out of remaining three (b), (c) and (d).

Unit-I

Q. 1. (a) Let f(x) be an even function then the value of a_n is : **2**

(i) $\frac{2}{\pi}\int_{-\pi}^{\pi} f(x)dx$

(ii) $\frac{2}{\pi}\int_{0}^{\pi} f(x)\cos nx\, dx$

(iii) $\frac{2}{\pi}\int_{-\pi}^{\pi} f(x)\cos nx\, dx$

(iv) none of these

(b) Find the Fourier series for the periodic f(x) with period 2π, where : **7**

$f(x) = |x|, -\pi < x < \pi$

Hence deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots\ldots=\frac{\pi^2}{8}$

(c) Express f(x) = x as a half-range cosine series in $0 < x < 2$. **7**

(d) Obtain the constant term and the coefficients of the first sine and cosine terms in the Fourier expansion of y as given in the following table : **7**

x	:	0	1	2	3	4	5
y	:	9	18	24	28	26	20

Unit-II

Q. 2. (a) If $L\left\{\frac{1}{t}f(t)\right\} = \int_0^{\infty} f(x)\, dx$ is called : **2**

(i) Multiplication by t

(ii) Division by t

(iii) Integrals of t

(iv) Derivative of t

(b) Find the Laplace transform of the following functions : 7

(i) $\frac{1-\cos at}{t}$

(ii) $\frac{e^{at}-\cos bt}{t}$

(c) Find the inverse Laplace transform of the following functions : 7

(i) $\cot^{-1}\left(\frac{s}{2}\right)$

(ii) $\tan^{-1}\left(\frac{2}{s^2}\right)$

(d) Solve : 7

$(D^2 + 9)\, x = \cos 2t$, if $x(0) = 1$, $x\left(\frac{\pi}{2}\right) = -1$

Unit-III

Q. 3. (a) State residue theorem. 2

(b) If $w = f(z) = u + iv$ is analytic function and $u - v = e^x(\cos y - \sin y)$. Find w in terms of z. 7

(c) Find the Laurent's series expansion of : 7

$f(z) = \frac{7z-2}{(z+1)\,z\,(z-2)}$ in theregion $1 < z + 1 < 3$

(d) Apply calculus of residues to prove that : 7

$$\int_0^{2\pi} \frac{\cos 2\theta\, d\theta}{5 + 4\cos\theta} = \frac{\pi}{6}$$

Unit-IV

Q. 4. (a) The complementry function of $(D^2 - a^2 D'^2)$ $z = 0$: 2

(i) $f_1 (y + ax) + f_2 (y + ax)$

(ii) $f_1 (y + ax) + f_2 (y - ax)$

(iii) $f_1 (y + ax) + xf_2 (y - ax)$

(iv) $f_1 (y - ax) + xf_2 (y - ax)$

(b) Solve : 7

$$x(y-z)p + y(z-x)q = z(x-y)$$

(c) Solve : 7

$$\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial y^2} = \cos 2x \cos 3y$$

(d) Solve : 7

$$z^2(p^2 + q^2) = x^2 + y^2$$

Unit-V

Q. 5. (a) The S.D. of the Binomial distribution is : 2

(i) $\sqrt{npq}$

(ii) $\sqrt{np}$

(iii) $\sqrt{nq}$

(iv) npq

(b) For the Binomial distribution df = sin x dx, $0 < x < \pi/2$, find : 3+4

(i) Mode and Median

(ii) Mean and Variance

(c) A box contains a white and b black balls, c balls are drawn. Show that the expectation of the number of white balls drawn is ca / (a + b). 7

(d) A car-hire firm has two cars, which it hires out day by day. The number of demands for a car on each day is distributed as a poisson distribution with mean 1.5. Calculate the proportion of days on which neither car is used and the proportion of days on which some demand is refused. ($e^{-1.5} = 0.2231$). 7