S-883

Total No. of Pages : 3

Seat No.	

S.E. (Civil Engg.) (Semester - III) Examination, Dec. - 2013
ENGINEERING MATHEMATICS - III
Sub. Code :42654

Day and Date : Tuesday, 17 - 12 - 2013 **Total Marks : 100**

Time : 10.00 a.m. to 1.00 p.m.

Instructions :
1) **Attempt any three questions from each section.**
2) **Figures to the right indicate full marks.**
3) **Use of Calculator is allowed.**

SECTION-I

Q1) a) Solve $(D^2-2D+1)^2y = \sinh x$ **[5]**

b) Solve $\frac{d^2y}{dx^2}+3\frac{dy}{dx}+2y= x^3 e^{-x}$ **[6]**

c) Solve $(x^2D^2 +xD+1)y = \cos(\log x)$ **[6]**

Q2) The differential equation of a cantilever beam of length l and weighing W kg per unit length subjected to a horizontal compressive force P applied at the free end is given by $EI\frac{d^2y}{dx^2}+Py+\frac{1}{2}Wx^2=0$. If $y=\delta$ & $\frac{dy}{dx}=0$ at $x=l$ and $\frac{d^2y}{dx^2}=0$ at $x=0$ then find the maximum deflection of the beam. **[16]**

Q3) a) Solve $pq = x^2y^3z^6$ **[5]**

b) Solve $p - q = pqz$ **[5]**

c) Solve $(x+y)^3 z-2xy\frac{\partial z}{\partial y}=(x^2+y^2)\frac{\partial z}{\partial x}$. **[6]**

P.T.O.

Q4) a) Obtain the Fourier series for $\sqrt{1+\cos x}$ in $0<x<2\pi$. **[9]**

b) Find the half range Cosine series for

$$f(x) = kx \quad \text{for } 0 < x < l/2$$
$$= k(l-x) \quad \text{for } l/2 < x < l$$

and hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + ---$ **[8]**

SECTION-II

Q5) a) Find the lines of regressions for the following data: **[6]**

x:	10	14	19	26	30	34	39
y:	12	16	18	26	29	35	38

and determine the reliability of estimate of y for x= 14.5.

b) The population of a city is given below.

Year:	1911	1921	1931	1941	1951	1961	1971	1981
Population in Lakhs:	3.9	5.3	7.3	9.6	12.9	17.1	23.2	30.5

Fit a curve of the form $y = ab^x$ to this data and estimate the population in 1991. **[6]**

c) Ten students got the following percentage of marks in Maths-I and Maths-II.

Roll No:	1	2	3	4	5	6	7	8	9	10
Marks in Maths-I:	78	36	98	25	75	82	90	62	65	39
Marks in Maths-II:	84	51	91	60	68	62	86	58	53	47

Calculate the coefficient of correlation. **[5]**

Q6) a) On an average a box containing 10 articles is likely to have 2 defective. If we consider a consignment of 100boxes, how many of them are expected to have three or less defective. **[5]**

b) In a sample of 1000 students the mean and standard deviation of marks obtained by the students in a certain test are 14 and 2.5. Assuming the distribution to be normal find the number of students getting marks

i) Between 12 and 15, ii) Above 18, iii) Below 8.

(Given S.N.V.Z area z=0 and z=0.4 is 0.1554, z=0 to z=0.8 is 0.2881, z=0 to z=1.6 is 0.4452, z=0 to z=2.4 is 0.4918). **[6]**

c) Seven coins are tossed and the number of heads obtained is noted. The experiment is repeated 128 times and the following distribution is obtained.

No of Heads:	0	1	2	3	4	5	6	7	Total
Frequency:	7	6	19	35	30	23	7	1	128

Fit a binomial distribution if the nature of the coin is not known. **[5]**

Q7) a) Prove that $\overline{F} = (x+2y+az)i + (bx-3y-z)j + (4x+cy+2z)k$ is solenoidal and determine the constants a,b,c if $\overline{F}$ is irrotational. **[6]**

b) In what direction from the point (2,1,-1) is the directional derivative of $\phi(x,y,z) = x^2yz^3$ a maximum. What is its magnitude. **[5]**

c) Find the angle between the normals to the surface $xy = z^2$ at the points (1,4,2) and (-3,-3,3). **[6]**

Q8) a) Use Divergence theorem to evaluate $\iint_S (y^2z^2\overline{i} + z^2x^2\overline{j} + x^2y^2\overline{k})\, ds$ where S is the upper part of the sphere $x^2+y^2+z^2 = 9$ above the xoy plane. **[8]**

b) Verify Stokes theorem for $\overline{F} = xy^2\overline{i} + y\overline{j} + z^2x\overline{k}$ for the surface of a rectangular lamina bounded by x = 0, y = 0, x = 1, y=2, z=0. **[8]**

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