3686

Engineering Mathematics - III
(1050)

P. Pages : 4

Time : Three Hours   **Max. Marks : 100**

Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory and carry equal marks.
5. Figures to right indicates full marks.
6. Use of non programmable calculator is allowed.
7. Use of statistical table is allowed.

1. Solve **any four.**   **20**

a) $\dfrac{d^2y}{dx^2} + 4y = x^2 + \sinh x$

b) $(D^2 - 5D + 6)\, y = e^x \cos 2x$

c) $D^2 y - y = x\sin 3x$

d) $\dfrac{d^2y}{dx^2} + y = \operatorname{cosec} x$ by method of variation of parameter.

e) $u = r\dfrac{d}{dr}\left(r\dfrac{du}{dr}\right) + qr^3$

f) The differential equation satisfied by a beam uniformly loaded with one end fixed and second subjected to a tensile force p is given by

$EI\,\dfrac{d^2y}{dx^2} = py - \dfrac{1}{2}Wx^2$

Show that the elastic curve for the beam under condition

$y = 0,\ \dfrac{dy}{dx} = 0$ at x = 0 is given by

$y = \dfrac{W}{pn^2}[1 - \cosh nx] + \dfrac{Wx^2}{2p}$

where $n^2 = \dfrac{p}{EI}$.

2. Attempt **any two.**

   a) i) Solve simultaneously   **7**

$$\frac{dx}{dt} + 5x - 2y = t$$

$$\frac{dy}{dt} + 2x + y = 0$$

    ii) Solve : $\dfrac{dx}{1} = \dfrac{dy}{1} = \dfrac{dz}{(1 + 2xy + 3x^2y^2)\,(x+y)z}$ **3**

   b)   **10**

Solve : $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = 0$ subject to the conditions

    i) $u(x, \infty) = 0$ for all x.

    ii) $u(0, y) = 0$ for all y.

    iii) $u(10, y) = 0$

    iv) $u(x, 0) = 100 \sin\left(\dfrac{\pi x}{10}\right);\ 0 \le x \le 10$

   c)   **10**

Solve : $\dfrac{\partial y}{\partial t} = C^2 \dfrac{\partial^2 y}{\partial x^2}$ subject to the conditions

    i) $y(0, t) = 0$

    ii) $y(l, t) = 0$

    iii) $\left(\dfrac{\partial y}{\partial t}\right)_{t=0} = 0$

    iv) $y(x, 0) = y_0 \sin^3\left(\dfrac{\pi x}{l}\right);\ 0 \le x \le l$

3. a) Attempt **any two.**   **8**

    i)   Find coefficient of variation from following data.

x	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
f	4	7	15	18	30	8

    ii)   The first four moment of a distribution about x = 5 are 2, 20, 40, 50 Calculate first four central moment. Also find β_1 and β_2.

    iii)   Define and Explain :

        i)   Skewness

        ii)   Kurtosis.

b) Attempt **any two** 12

p) Calculate first four moment about mean from given data. Also find β_1 and β_2.

x	2	2.5	3	3.5	4	4.5	5
f	4	36	60	90	70	40	10

q) Estimate the value of y when x = 10 from given data.

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

r) The two regression equations of variable x, y are 20x – 9y = 107 and 4x – 5y + 33 = 0.
Find :
i) mean values of x and y
ii) coefficient of correlation between x and y.
iii) S.D. of y if variance of x is 9.

4. Attempt **any four.** 20

a) Three groups of children contain respectively 3 girls and 1 boy, 2 girls and 2 boys, 1 girl and 3 boys. One child is selected at random from each group, find chance of selection of 1 girl and 2 boys.

b) If on an average one ship in every 10 is wrecked, find probability that out of 5 ships expected to arrive. 4 at least will arrive safely.

c) A manufacturer knows that the condensers he makes contain on an average of 1% of defectives. He packs them in a boxes of 100. What is the probability that a box picked at random will contain 4 or more faulty condensers.

d) A manufacturer produces an airmail envelopes, whose weight is normal with mean 1.95 gm and S.D. of 0.05 gm. The envelope are sold in a lots of 1000. How many envelopes a lot will be heavier than 2gm?

e) Fit a Poisson's distribution and calculate theoretical frequencies from given data.

x	0	1	2	3	4	5
f	142	158	67	27	5	1

f) In an investigation into the health and nutrition of two groups of children of different social status the following result is obtain.

Health \ Social Status	Poor	Rich	Total
Below Normal	130	20	150
Normal	102	108	210
Above Normal	24	96	120
Total	256	224	480

Discuss relation between the health and their social status.

[Given $\chi^2_{(0.05,2)} = 5.99$]

5. Attempt **any two.**

a) i) Write down the procedure for testing of hypothesis for large sample. **4**

ii) In a sample of 600 men from a certain city 450 are found tea drinker. In another sample of 900 men from another city, 450 are tea drinker. Do the data indicates that the cities are differ significantly with respective to the habit of tea drinking among men? **6**

b) p) Define sampling and write types of sampling. **4**

q) A mean lifetime of sample of 100 fluorescent light bulbs produce by a company is completed to be 1570 hours with standard deviation of 120 hours. The company claim that the average life of the bulbs produce by it is 1600 hours. Using 5% L.O.S., is the claim is acceptable? **6**

c) x) Define errors in testing of hypothesis. **4**

y) The following table gives the two wheeler accidents occurred during week. **6**

Days	Sun	Mon	Tue	Wed	Thur	Fri	Sat
Accidents	14	16	08	12	11	09	14

Can you say that the accidents are uniformly distributed over the week.

[Given $\chi^2_{(0.05,6)} = 12.59$].

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