SE - ME - Sem IV - OLD

Mon IV

23/11/15

QP Code : 1304

(3 Hours) **Total Marks: 100**

N.B. (1) Question No.1 is compulsory.
(2) Attempt any four questions out of the remaining six questions.
(3) Figures to right indicate full marks.

Q. 1 (a) Find the Fourier series for $f(x)=x^2$ in $(-2,\ 2)$ 5

(b) Write down the probability distribution of the sum of numbers appearing on the toss of two unbiased dice. Hence find mean of the distribution 5

(c) A soap manufacturing company was distributing a particular brand of soap through a large numbers of retail soaps. Before a heavy advertisement campaign the mean sales per week per soap was 140 dozens. After the campaign a sample of 26 soaps was taken & the mean sale was found to be 147 dozens with S.D of 16. Can you consider the advertisement effect? 5

(d) Derive wave equation for Vibration of string 5

Q.2 (a) A discrete random variable has the probability density function given below 6

$X=x_i$	-2	-1	0	1	2	3
$P(x_i)$	0.2	K	0.1	2K	0.1	2K

Find K, mean, variance.

(b) Find the Fourier expansion for $f(x)=\frac{3x^2-6x\pi+2\pi^2}{12}$ *in* $(0,\ 2\pi)$ 6

(c) Fit a Binomial distribution to the following data. 8

x:	0	1	2	3	4	5	6
f:	5	18	28	12	7	6	4

Q.3 (a) Obtain Fourier series for 6

$$f(x)=x\cos x,\quad in\quad (-\pi,\pi)$$

(b) Calculate the Correlation coefficient from the following data. 6

x:	12	17	22	27	32
y:	113	119	117	115	121

(c) Obtain the equation of the line of regression of cost on age from the following table giving the age of a car of certain make and the annual maintenance cost 8

Age of car:	2	4	6	8
Maintenance:	1	2	2.5	3

Q.4 (a) The probability that a bomb will hit the target is 0.2, two bombs are required to destroy the target. If six bombs are used, find the probability that the target will be destroyed. 6

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(b) Obtain half-range sine series for 6

$$f(x) = x, \quad 0 < x < 1$$
$$= 2 - x, \quad 1 < x < 2$$

(c) Calculate rank correlation coefficient for the following data: 8

x:	12	17	22	27	32
y:	113	119	117	115	121

Q.5 (a) Obtain Fourier series for $f(x) = 4 - x^2$, *in* $(0, 2)$ 6

(b) Fit a Poisson distribution to the following data. 6

x:	0	1	2	3	4	5	Total
f:	142	156	69	27	5	1	400

(c) Solve the one dimensional wave equation $\frac{\partial^2 u}{\partial t^2} = a^2 \frac{\partial^2 u}{\partial x^2}$ under the condition 8

$u = 0$ *when* $x = 0$ & $x = \pi$,

$\frac{\partial u}{\partial t} = 0$ *when* $t = 0$ & $u(x, 0) = x, \quad 0 < x < \pi$

Q.6 (a) Obtain complex form of Fourier series for $f(x) = e^x$ in $(-\pi, \pi)$. 6

(b) Assuming that the diameters of 1000 brass plugs taken consecutively from a normal distribution with mean 0.7517 cm. & standard deviation 0.0020 cm. How many plugs are likely to be rejected if the approved diameter is 0.752 ± 0.004 6

(c) Fit a second degree curve to the following data- 8

x	1	2	3	4	5	6	7	8	9
y	2	6	7	8	10	11	11	10	9

Q.7 (a) The number of car accidents in a metropolitan city was found to be 20, 17, 12, 6, 7, 15, 8, 5, 16, & 14 per month respectively. Use χ^2-test to check whether these frequencies are in an agreement with the belief that occurrence of accident was the same during 10 months period. Test at 5%level of significance. 6

(b) A sample of 100 students is taken from a large population. The mean height of the student in this sample is 160 cms. Can it be reasonable that in the population, the mean height is 165cms and standard deviation is 10cms ? 6

(c) A rod of length ''b'' with insulated sides is initially at a uniform temperature u_0. Its ends are suddenly cooled to $0^0 C$ and are kept at that temperature. Find the temperature function. 8