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Question Paper Code : 21528

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Fourth Semester

Mechanical Engineering

MA 2266/MA 42/MA 1254/10177 SN 401/080120014 — STATISTICS AND NUMERICAL METHODS

(Common to Automobile Engineering and Production Engineering)

(Regulation 2008/2010)

(Common to PTMA 2266 – Statistics and Numerical methods for B.E. (Part – Time) Second Semester – Production Engineering – Regulation 2009)

Time : Three hours Maximum : 100 marks

Statistical tables may be permitted.

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. It has been found that 2% of the tools produced by a certain machine are defective. What is the probability that in a shipment of 400 such tools

   (a) 3% or more,

   (b) 2% or less will prove defective.

2. A random smple of 200 tins of coconut oil gave an average weight of 4.95 kgs. With a standard deviation of 0.21 kg.
   Do we accept that the net weight is 5 kgs per tin at 5% level?

3. What do you understand by "Design of an experiment"?

4. Write down the ANOVA table for one way classification.

5. Find the real positive root of $3x - \cos x - 1 = 0$ by Newton's method correct to 6 decimal places.

6. Solve the equations $A+B+C=6$, $3A+3B+4C=20$, $2A+B+3C=13$ using Gauss elimination method.

7. Use Lagrange's formula to fit a polynomial to the data and find y at $x=1$.

X	–1	0	2	3
Y	–8	3	1	12

8. Show that the divided difference of second order can be expressed as the quotient of two determinants of third order.

9. Using Taylor series method, find y at $x=0.1, 0.2$ given $\frac{dy}{dx}=x^2-y$, $y(0)=1$ (correct to 4 decimal places).

10. Compute y at $x=0.25$ by Modified Euler method given $y'=2xy$, $y(0)=1$.

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) Random samples drawn from two countries gave the following data relating to the heights of adult males. Is the difference between standard deviation significant? (8)

	Country A	Country B
Mean height (in inches)	67.42	67.25
S.D (in inches)	2.58	2.50
Number in samples	1000	1200

(ii) 1000 students at college level were graded according to their I.Q. and their economic conditions. What conclusion can you draw from the following data : (8)

Economic conditions	I.Q. Level	
	High	Low
Rich	460	140
Poor	240	160

Or

(b) (i) The sales manager of a large company conducted a sample survey in states A and B taking 400 samples in each case. The results were in the following table. Test whether the average sales in the same in the 2 states at 1% level. (8)

	State A	State B
Average sales	Rs. 2,500	Rs. 2,200
S.D.	Rs. 400	Rs. 550

(ii) Find if there is any association between extravagance in fathers and extravagance in sons from the following data. Determine the coefficient of association also (8)

	Extravagant father	Miserly father
Extrav. Sons	Under 327	741
Miser. Sons	545	234

12. (a) (i) The following date represent the number of units of production per day turned out by 5 different workers using 4 different types of machines. (8)

		Machine Type			
		A	B	C	D
Workers	1	44	38	47	36
	2	46	40	52	43
	3	34	36	44	32
	4	43	38	46	33
	5	38	42	49	39

(1) Test whether the mean production is the same for the different machine types

(2) Test whether the 5 men differ with mean productivity.

(ii) The following is a Latin square of a design when 4 varieties of seeds are being tested. Set up the analysis of variance table and state your conclusion. You may carry out suitable change of origin and scale. (8)

A	105	B	95	C	125	D	115
C	115	D	125	A	105	B	105
D	115	C	95	B	105	A	115
B	95	A	135	D	95	C	115

Or

(b) (i) Compare and contrast the Latin square Design with the Randomised Block Design. (8)

(ii) Analyse the following of Latin square experiment. (8)

Column Row	1	2	3	4
1	A(12)	D(20)	C(16)	B(10)
2	D(18)	A(14)	B(11)	C(14)
3	B(12)	C(15)	D(19)	A(13)
4	C(16)	B(11)	A(15)	D(20)

13. (a) (i) Solve the system of equations by Gauss – Jordan method $x+y+z+w=1$; $2x-y+2z-w=-5$; $3x+2y+3z+4w=7$; $x-2y-3z+2w=5$. (8)

(ii) Solve by Gauss – Seidal method the following system : $28x+4y-z=32$; $x+3y+10z=24$; $2x+17y+4z=35$. (8)

Or

(b) (i) Solve by Gauss – Elimination method $3x+4y+5z=18$; $2x-y+8z=13$; $5x-2y+7z=20$. (8)

(ii) Using power method, find all the eigen values of $A=\begin{bmatrix}5 & 0 & 1\\ 0 & -2 & 0\\ 1 & 0 & 5\end{bmatrix}$. (8)

14. (a) (i) By dividing the range into ten equal parts, evalute $\int_0^{\pi}\sin x\,dx$ by Trapezoidal and Simpson's rule. Verify your answer with integration. (8)

(ii) If $(x)=\frac{1}{x}$, show that $f(x_0,x_1,.....,x_n)=\frac{(-1)^r}{x_0x_1....x_r}$. Where r is any positive integer. (8)

Or

(b) (i) The population of a certain town is given below. Find the rate of growth of the population in 1931, 1941, 1961 and 1971. (8)

Year (x)	1931	1941	1951	1961	1971
Population in thousands (y)	40.62	60.80	79.95	103.56	132.65

(ii) Using Newton's divided difference formula, find the values of $f(2)$, $f(8)$ and $f(15)$ given the following table. (8)

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

15. (a) (i) Solve $y_{x+2}-7y_{x+1}-8y_x=x(x-1)2^x$. (8)

(ii) Using Runge – Kutta method of fourth – order, solve $\frac{dy}{dx}=\frac{y^2-x^2}{y^2+x^2}$ given $y(0)=1$ at $x=0.2,0.4$. (8)

Or

(b) Given $y''+xy'+y=0$, $y(0)=1$, $y'(0)=0$, find the value of $y(0.1)$ by using Runge – Kutta method of fourth order. (16)
