B. Tech. Sem - III (Mechanical Engg.) (2014 COURSE) (CBCS) :
SUMMER - 2019
SUBJECT: ENGINEERING MATHEMATICS – III

Day: Thursday
Date: 09/05/2019

Time: 02.30 PM TO 05.30 PM
Max. Marks: 60

S-2019-2575

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of non- programmable **CALCULATOR** is allowed.

Q.1 **a)** Solve by method of variation of parameters: **(05)**

$$\left(D^2-1\right)y=e^{-x}\sin\left(e^{-x}\right)+\cos\left(e^{-x}\right)$$

b) Solve: $\frac{dx}{zy^2}=\frac{dy}{x^2z}=\frac{dz}{y^2x}$ **(05)**

OR

Q.1 **a)** Solve: $\left(D^2+D\right)y=\frac{1}{1+e^x}$ **(05)**

b) Solve: $\left(2x+1\right)^2\frac{d^2y}{dx^2}-2\left(2x+1\right)\frac{dy}{dx}-12y=6x.$ **(05)**

Q.2 Find the Fourier sine and cosine transform of the function $f\left(x\right)=e^{-x}$ and hence show that $\int_0^\infty \frac{\cos mx}{1+x^2}dx=\frac{\pi}{2}e^{-m}$ and $\int_0^\infty \frac{x\sin mx}{1+x^2}dx=\frac{\pi}{2}e^{-m}$ **(10)**

OR

Q.2 **a)** Obtain Laplace transform of: $\frac{d}{dt}\left(\frac{\sin t}{t}\right)$ **(05)**

b) Obtain Inverse Laplace transform of: $\cot^{-1}\left(\frac{s-2}{3}\right)$. **(05)**

Q.3 A string is stretched and fastened to two points l apart. Motion is started by displacing the string in the form $u=a\sin\frac{\pi x}{l}$ from which it is released at time $t=0$. Find the displacement $u\left(x,t\right)$ from one end. **(10)**

OR

Q.3 Solve: $\frac{\partial u}{\partial t}=k\frac{\partial^2 u}{\partial x^2}$ if **(10)**

i) $u\left(x,t\right)$ is bounded

ii) $u\left(0,t\right)=0$

iii) $u\left(l,t\right)=0$

iv) $u\left(x,0\right)=\frac{u_o x}{l}, 0\le x\le l$

P. T. O.

Q.4 Fluctuation in the aggregate of marks obtained by two groups of students are given below. Find out which of the two shows greater variability. **(10)**

Group A	518	519	530	530	544	542	518	550	527	527	531	550	550	529	528
Group B	825	830	830	819	814	814	844	842	842	826	832	835	835	840	840

OR

Q.4 Calculate mean, median and mode of the following data relating to weight of 120 articles. **(10)**

Weight (in gm):	0-10	10-20	20-30	30-40	40-50	50-60
No. of articles:	14	17	22	26	23	28

Q.5 Calculate lines of regression for the following weighs (in Kg) of husband *(x)* and wife *(y)*. **(10)**

x	65	66	67	67	68	69	70	72
y	55	58	72	55	66	71	70	50

OR

Q.5 Two examiners A and B independently award marks to seven students. **(10)**

Roll No.	1	2	3	4	5	6	7
Marks by A:	40	44	28	30	44	38	31
Marks by B:	32	39	26	30	38	34	28

Obtain the equations of regression lines. If examiners A award 36 marks to Roll No. 8. What would be the marks expected to be awarded by examiner B to the same candidate?

Q.6 a) A can hit the target 1 out of 4 times B can hit the target 2 out of 3 times, C can hit target 3 out of 4 times. Find the probability of atleast two hit the target. **(05)**

b) Three machines M_1, M_2 and M_3 produce identical items of their respective output 5%, 4% and 3% of items are faulty. On a certain day, M_1 has produced 25% of the total output M_2 has produced 30% and M_3 the reminder. An item selected at random is found to be faulty. What are the chances that it was produced by the machine with the highest output? **(05)**

OR

Q.6 a) In a sampling a large number of parts manufactured by a machine, the mean number of defectives in a sample of 20 is 2. Out of 1000 such samples, how many would be expected to contain atleast 3 defective parts. **(05)**

b) In a test on 2000 electric bulbs, it was found that the life of a particular make, was normally distributed with an average life of 2040 hours and S.D. of 60 hrs. Estimate the number of bulbs likely burn for **(05)**

i) more than 2150 hours

ii) less than 1950 hours.

(Given $A_{z=1.83} = 0.4664$, $A_{z=1.33} = 0.4082$)

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