

B. TECH. SEM - III (MECHANICAL ENGG.) (2014 COURSE)

(CBCS) : SUMMER - 2018

SUBJECT: ENGINEERING MATHEMATICS – III

Day: Monday
Date: 21/05/2018

S-2018-2254

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

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat and labelled diagrams **WHEREVER** necessary.
- 4) Use of non-programmable **CALCULATOR** is allowed.

Q.1 a) Solve by method of variation of parameters: $(D^2 + 1)y = \operatorname{cosec} x$. (05)

b) Solve: $(D^3 - 4D)y = 2 \cosh 2x$. (05)

OR

Q.1 a) Solve: $x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + 4y = \cos(\log x) + x \sin(\log x)$. (05)

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

Q.2 a) Find the Laplace frons from of: $f(t) = \frac{\cos \sqrt{t}}{\sqrt{t}}$ (05)

b) Find the inverse Laplace transform of: $\frac{s+2}{(s^2+4s+5)^2}$. (05)

OR

Q.2 Find the Fourier cosine transform of $f_1(x) = \frac{1}{1+x^2}$. and hence find the Fourier (10)

sine transform of $f_2(x) = \frac{x}{1+x^2}$.

Q.3 If $\frac{\partial^2 y}{\partial t^2} = C^2 \frac{\partial^2 y}{\partial x^2}$ represent the vibrations of a string of length l fixed at both (10)

ends, find the solution with boundary conditions,

i) $y(0, t) = 0$ ii) $y(l, t) = 0$ and initial conditions,

iii) $\left(\frac{\partial y}{\partial t}\right)_{t=0} = 0$ iv) $y(x, 0) = k(lx - x^2)$, $0 \leq x \leq l$.

OR

Q.3 A square metal plate of side 'a' has edges represented by lines (10)
 $x=0$, $x=a$, $y=0$, $y=a$. The edges $x=a$ and $y=a$ are insulated. The edge
 $x=0$ is kept at 0°C and $y=0$ at $u_0^\circ\text{C}$, where u_0 is a constant. Obtain the
temperature distribution $u(x, y)$ under steady state conditions.

P. T. O.

- Q.4** The scores obtained by two batsmen A and B in 10 matches are given below: **(10)**

A	30	44	66	62	60	34	80	46	20	38
B	34	46	70	38	55	48	60	34	45	30

Calculating mean, SD and coefficient of variation for each batsman, determine who is more efficient and who is more consistent.

OR

- Q.4** The first four moments about the working mean 28.5 of a distribution are 0.294, 7.144, 42.409 and 454.98. Calculate the moments about the mean. Also evaluate β_1, β_2 and comment upon the skewness and Kurtosis of the distribution. **(10)**

- Q.5 a)** Calculate the correlation coefficient for the following weights (in kg) of husband (x) and wife (y). **(05)**

X	65	66	67	67	68	69	70	72
Y	55	58	72	55	66	71	70	50

- b)** Calculate the coefficient of correlation from the following information: **(05)**
 $n=10, \sum x = 40, \sum x^2 = 190, \sum y^2 = 200, \sum xy = 150, \sum y = 40.$

OR

- Q.5** The regression equations are $8x - 10y + 66 = 0$ and $40x - 18y = 214$. The value of variance of x is 9. Find: **(10)**
 i) the mean values of x and y .
 ii) the correlation coefficient between x and y and
 iii) the standard deviation of y .

- Q.6 a)** Two cards are drawn from a well shuffled pack of 52 cards. Find the probability that they are both kings if: **(05)**
 i) the first card drawn is replaced.
 ii) first card drawn is not replaced.

- b)** Three machines M_1, M_2 and M_3 produce identical items of 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 remainder. 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)** On an average a box containing 10 articles is likely to have 2 defectives. If we consider a consignment of 100 boxes, how many of them are expected to have three or less defective? **(05)**

- b)** A nationalized bank utilizes four teller windows to render fast service to the customers. On a particular day, 800 customers were observed. They were given service at different windows as follows: **(05)**

Window Numbers	Expected Number of customers
1	150
2	250
3	170
4	230

Test whether the customers are uniformly distributed over the windows. (Table value $\chi^2_{3,0.05} = 7.815$).