

B. Tech. Sem - III (Mechanical Engg.) (2014 COURSE) (CBCS) :
WINTER - 2018

SUBJECT: ENGINEERING MATHEMATICS – III

Day: Friday
Date: 23/11/2018

W-2018-2310

Time: 10.00 AM TO 01.00 PM
Max. Marks: 60

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: $(D^2 - 2D + 2)y = e^x \tan x$ **(05)**

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

OR

Q.1 a) Solve: $(D^2 + 5D + 6)y = e^{-2x} \sec^2 x (1 + 2 \tan x)$ **(05)**

b) Solve: $x^3 \frac{d^2 y}{dx^2} + 3x^2 \frac{dy}{dx} + xy = \sin(\log x)$ **(05)**

Q.2 a) Obtain Laplace transform of: $e^{-4t} \int_0^t t \sin 3t \, dt$. **(05)**

b) Obtain Inverse Laplace transform: $\frac{s+2}{(s^2+4s+5)^2}$. **(05)**

OR

Q.2 Find the Fourier sine and cosine transform of $f(x) = x^{m-1} (m > 0)$ **(10)**

Q.3 Solve one dimensional heat flow equation $\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$ for function $u(x, t)$ **(10)**

subject to conditions:

i) $u(0, t) = 0$ and

ii) $u(\pi, t) = 0$ for all t

iii) $u(x, 0) = \pi x - \pi x^2, 0 < x < \pi$

iv) $u(x, \infty)$ is finite

OR

Q.3 A tightly stretched string with fixed end points $x = 0$ and $x = l$ is initially in a **(10)**

position given by $y(x, 0) = y_0 \sin^3\left(\frac{\pi x}{l}\right)$, If it is released from rest from this

position, find the displacement y at any distance x from one end and at any time t .

P. T. O.

- Q.4** The following given the marks obtained in a papers of statistics out of 50, by the students of two division A and B. (10)

Class	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
Division A:	2	6	8	8	15	18	12	11	9	4
Division B:	3	5	7	9	12	16	11	5	6	2

Find out which of the two division shows greater variability.

OR

- Q.4** Compute the first four moment about the mean, coefficient of skewness and kurtosis for the following frequency distribution: (10)

No. of Jobs completed:	0-10	10-20	20-30	30-40	40-50
No. of workers	6	26	47	15	6

- Q.5** Calculate the regression equation of x on y and y on x from the following data and estimate x when $y = 26$ and estimate y when $x = 21$. (10)

x	10	12	13	17	18	20	24	30
y	5	6	7	9	13	15	20	21

OR

- Q.5 a)** Ten students got the following percentage of marks in Economics and statistics. (05)

Marks in Economics:	78	36	98	25	75	82	90	62	65	39
Marks in Statistics:	84	51	91	60	68	62	86	58	53	47

Calculate coefficient of correlation.

- b)** Find the correlation coefficient from the following data: (05)
 $n = 10$, $\sum x_i = 300$, $\sum y_i = 250$, $\sum (x_i - 30)^2 = 154$, $\sum (y_i - 25)^2 = 162$,
 $\sum (x_i - 30)(y_i - 25) = 144$.

- Q.6 a)** A problem on computer mathematics is given to the three students A, B and C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problems will be solve? (05)

- b)** In a bolt factory, machines A, B and C manufacture 25%, 35% and 40% of the total of their output 5%, 4% and 2% are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A, B and C? (05)

OR

- Q.6 a)** In 256 sets of 12 tosses of a coin in how many cases one can expect 8 heads and 4 tails. (05)

- b)** The incomes of a group of 10,000 persons were found to be normally distributed with mean Rs.750 per month and S.D. is Rs.50 show that this group person had about 95% income exceeding Rs.668 and only 5% had income exceeding Rs.832. (Given $A_z = 1.64 = 0.4495$). (05)

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