

**B. TECH. SEM - III (MECHANICAL ENGG.) (2014 COURSE) (CBCS)
: WINTER - 2017**

SUBJECT: ENGINEERING MATHEMATICS-III

Day: Friday
Date: 12/01/2018

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

W-2017-2046

N.B:

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

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

$$(D^2 + 3D + 2)y = e^{e^x}$$

b) Solve: $(D^2 - 4D + 3)y = x^3 e^{2x}$ **(05)**

OR

Q.1 a) Solve: $(2x+3)^2 \frac{d^2 y}{dx^2} - 2(2x+3) \frac{dy}{dx} - 12y = 6x$ **(05)**

b) Solve: $\frac{dx}{mz - ny} = \frac{dy}{nx - lz} = \frac{dz}{ly - mx}$ **(05)**

Q.2 a) Obtain Laplace transform of: **(05)**

$$f(t) = \frac{e^{-at} - e^{-bt}}{t}$$

b) Using partial fractions, find the inverse Laplace transform of: $\frac{3s+7}{s^2-2s-3}$ **(05)**

OR

Q.2 Show that Fourier transform of $f(x) = e^{-\frac{x^2}{2}} \text{ is } e^{-\frac{\lambda^2}{2}}$ **(10)**

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 $u(x, t)$ from one end. **(10)**

(Use wave equation $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$)

OR

Q.3 Solve $\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}$ for the conduction of heat along a rod without radiation, **(10)**

subject to the following conditions:

- i) u is not infinite as $t \rightarrow \infty$
- ii) $\frac{\partial u}{\partial x} = 0$ for $x = 0, x = l$ (i.e. ends are insulated i.e. no heat flows through the end) and
- iii) $u = lx - x^2$ for $t = 0$ between $x = 0, x = l$.

Q.4 a) Calculate Arithmetic mean and Mean deviation of the following frequency distribution: **(05)**

X	1	2	3	4	5	6
Y	3	4	8	6	4	2

P.T.O.

- b) Calculate standard deviation for the following frequency distribution: (05)

Wages in Rupees earned per day	0-10	10-20	20-30	30-40	40-50	50-60
No. of laborers	5	9	15	12	10	3

OR

- Q.4 Calculate the first four moment about the mean of the given distribution. Also find β_1 and β_2 . (10)

X	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Y	4	36	60	90	70	40	10

- Q.5 a) From a group of 10 students, marks obtained by each in papers of Mathematics and Applied mechanics are given as: (05)

X marks in Maths	23	28	42	17	26	36	29	37	16	46
Y marks in App. Mech	25	22	38	21	27	39	24	32	18	44

Calculate Karl Person's Coefficient of correlation.

- b) Given $n=6$, $\sum(x-18.5)=-3$, $\sum(y-50)=120$, (05)
 $\sum(x-18.5)^2=19$, $\sum(y-50)^2=850$,
 $\sum(x-18.5)(y-50)=120$.

From the above data, calculate coefficient of correlation.

OR

- Q.5 Determine the equations of regression lines for the following data: (10)

X	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

And obtain an estimate of y for x = 4.5

- Q.6 a) A box contains 6 red balls, 4 white balls and 5 blue balls. Three balls are drawn successively from the box. Find the probability that they are drawn in the order red, white and blue if each ball is not replaced. (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 is the probability that it was manufactured by machine A? (05)

OR

- Q.6 a) The mean and variance of Binomial distribution are 6 and 2 respectively. Find $p(r \geq 1)$. (05)
- b) The table below gives number of books issued from a certain library on the various days of a week. (05)

Days	Mon	Wed	Thu	Fri	Sat	Sun
No. of books issued	120	130	110	115	135	110

Test at 5% l.o.s., whether the issuing the book is day dependent.

(Table Value $\chi_{5,0.05}^2=11.07$)

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