Time : 2 ½ hours.   Max.Marks : 75
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Note : 1) All questions are compulsory
       2) Attempt <u>any three sub questions</u> from each question.
       3) Graph papers will be provided on request.
       4) Calculators are allowed .
       5) Figures to the right indicate marks.

Q.1.a) What is a network analysis ? What are its objectives ?   (6)

b) Explain the three estimates in PERT.   (6)

c) A small project consists of following activities . Construct a network   (7)
diagram for the project and identify the critical path and project
completion time .Also find the tail slack   and head slack for each
activity.

Activity :	A	B	C	D	E	F	G	H
Preceeding Activities :	–	A	A	B	B,C	B	D	E,F
Time in days :	8	2	4	3	6	3	1	4

d) A project manager has made following three points time estimates for   (7)
various activities of a project :-

Events	Estimated duration	(in weeks)	
	Optimistic	Most likely	Pessimistic
1-2	2	2	14
1-3	2	8	14
1-4	4	4	16
2-5	2	2	2
3-5	4	10	28
4-6	4	10	16
5-6	6	12	30
6-7	2	4	6

Draw the PERT network and find out the expected project completion time
and project variance .

Q.2.a) Define the following terms :-   (6)
       i) Population.
       ii) Sample.
       iii) Parameter.
       iv) Statistics.

b) What is simple random sampling ? Explain simple random sampling with   (6)
replacement and without replacement ?

c) Distinguish between :-   (7)
       (i) Sample survey and census survey'.
       (ii) Sampling error and non sampling error

[P.T.O.]

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d) Consider a population of six units with values 1,2,3,4,5 and 6 .Write down (7) all possible samples of size 2 without replacement from this population and verify that the sample mean is an unbiased estimate of the population mean. Also calculate its sampling variance.

Q.3.a) Define a time series. Mention its important components . Explain each of (7) them briefly.

b) Explain different methods of estimating trend. (6)

c) Fit a parabolic curve of second degree to the data given below and (7) estimate the value for 2008 :-

Year :-	2002	2003	2004	2005	2006
Sales in ('000s):-	10	12	13	10	8

d) The following table gives the number of workers employed in a small (6) industry during the years 1996 to 2005. Calculate the four yearly moving averages :-

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
No. Of Workers	430	470	450	460	480	470	470	500	490	480

Q.4.a) Explain the procedure to do the numbering of nodes in a network diagram. (5)

b) A simple random sample of size two is drawn with replacement from a (5) population of 4 units 50, 60, 64 and 70 . Find the estimate of the population mean.

c) Fit a straight line trend by the method of least squares to the following (5) data and estimate the production for the year 2009 :-

Year	2002	2003	2004	2005	2006	2007	2008
Production in '00s	98	105	116	135	156	177	208

d) Find seasonal indices using trend free data. Assuming additive model and (5) multiplicative model.

Quarters

year	I	II	III	IV
1998	30	81	62	119
1999	33	104	86	171
2001	42	153	99	221
2002	56	172	129	235
2003	67	201	135	302

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