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SEAT No. :

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BE/INSEM/APR-519

B.E. (Mechanical & Mechanical S/W) (Semester - II)

402048 : MECHANICAL SYSTEM DESIGN

(2015 Pattern)

Time : 1½ Hour]

Instructions to the candidates

- 1) Answer Q1 or Q2, Q3 or Q4 and Q5 or Q6.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.

[Max. Marks : 30

Q1) a) Explain the term : Maximum loss of economic cutting speed. [4]

b) Draw the systematic structure diagrams and identify the optimum structure diagram for the following structural formulae: [6]

- i)  $z=2(1) 2(2) 3(4)$
- ii)  $z=2(1) 2(6) 3(2)$
- iii)  $z=2(2) 2(1) 3(4)$

OR

Q2) A six speed gear box is to be designed for a machine tool drive. The spindle speed ranges between 200rpm to 1200 rpm. If the gear box is driven by motor of 8 KW, 1200 rpm through belt drive. Draw the speed diagram and gearing diagram. [10]

Q3) a) Give the comparison between normal distribution and standard distribution curves? [4]

b) A ball bearing has normally distributed time to failure, with a mean of 15000 h and Standard deviation of 1000 h. If there are 100 such bearing fitted at a time, how many may be expected to fail within the first 16500 h? [6]

z	0	1	2	3	4	5
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394

P.T.O.

OR

Q4) A straight tensile bars of diameter  $10^{+0.1}_{-0}$  mm are made of plain carbon steel 40C8 having tensile yield strength of  $330 \pm 30$  N/mm<sup>2</sup>. The load on the bars is  $23.5 \pm 5$  KN, if the diameters, strength and loads are normally distributed; estimate the reliability of withstanding the load by the bars. The areas under the standard normal distribution curve from 0 to Z are as follows : [10]

z	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4
area	0.3413	0.3849	0.4192	0.4452	0.4641	0.4772	0.4861	0.4918

Q5) a) State the appropriate guidelines for selection of material handling system. [4]

b) A three idler, troughed belt, horizontal conveyor is to be used for transporting 500 ton of iron per hour having mass density of iron ore is  $1700 \text{ kg/m}^3$ . If the belt speed is 2m/sec, determine the required belt width. Take surcharge factor = 0.1. [6]

OR

Q6) An inclined 3 ply belt conveyor transporting 1.5 ton per hour at a speed of 75 m/min, with horizontal distance of traverse 900m and height 300m. The mass density of material is  $2.5 \text{ ton/m}^3$  and speed of electric motor is 1500rpm. Calculate : [10]

- Width of belt
- Diameter of Drive pulley
- Gear box reduction ratio

Conveyor inclination	$10^\circ-15^\circ$	$16^\circ-20^\circ$	$21^\circ-25^\circ$	$26^\circ-30^\circ$
Flow-ability factor	$2.65 \times 10^{-4}$	$2.5 \times 10^{-4}$	$2.35 \times 10^{-4}$	$2.2 \times 10^{-4}$

Assume material factor for plies,  $K_1 = 2.5$  and

Factor for belt tension and arc of contact,  $K_2 = 80$ .

Standard Belt widths(mm)

300, 400, 450, 500, 600, 650, 750, 800, 900, 1000, 1200, 1400, 1600, 1800, 2000, 2200, 2400.



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