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SEAT No. :

P191

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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]

[Max. Marks : 30

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.

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 $10^{+0.1}$ mm are made of plain carbon steel 40C8 having tensile yield strength of 330 ± 30 N/mm². The load on the bars is 23.5 ± 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 kg/m³. 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 Ton/m³ and speed of electric motor is 1500rpm. Calculate : [10]

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

| | | | | |
|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| Conveyor inclination | 10°-15° | 16°-20° | 21°-25° | 26°-30° |
| Flow-ability factor | 2.65×10^{-4} | 2.5×10^{-4} | 2.35×10^{-4} | 2.2×10^{-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.

