

COLLEGE OF ENGINEERING, PUNE

END Sem Exam

(PE-310) Process Planning and Statistical Process Control

Programme: T.Y B. Tech (Production Sandwich)

Year: 2011-12

Duration: 3 hr

Semester – II

Max. Marks: 50

Date 8th May 2012

Instructions:

1. Solve any five questions.
2. Figures to the right indicate full marks.
3. Draw neat diagrams wherever necessary.

Q.1 a) A certain stimulus administered to each of the 12 patients resulted in the following increase in blood pressure

5, 2, 8, -1, 3, 0, -2, 1, 5, 0, 4, 6

(5)

Can it be concluded that the stimulus will in general, be accompanied by increase in blood pressure?

b) Tests were done at short intervals on spark plugs from two manufacturers. The following tabulation gives the number of hours of service given by plugs from two sources.

A	200	210	190	200	190	200	180	200	200	210
B	190	200	210	190	180	190	200			

(5)

Do these results indicate a statistically significant difference between the spark plugs so far as mean length of service is concerned?

Q.2 a) How system reliability is calculated for series and parallel systems? Explain with the help of example.

(5)

b) Explain the basic principles used in Design of Experiments.

(5)

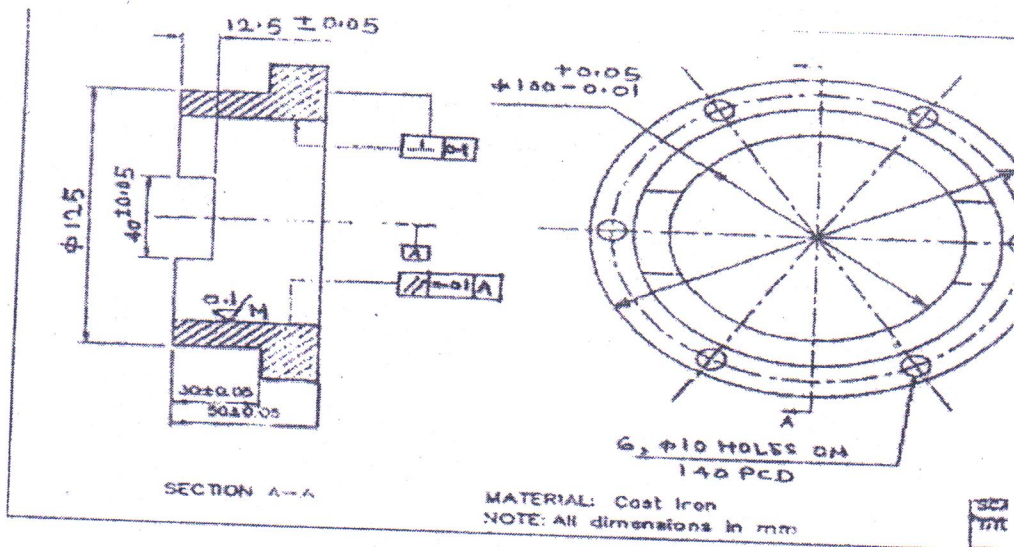
Q.3. a) What does a process engineer seek to determine from part prints? How does shape and size of the part affect the manufacturing process? State the problems associated.

(5)

b) Identify and describe the functions of process engineer in a manufacturing organisation.

(5)

- Q.4 a) Explain the various symbols used in defining surface finish with diagrams. (5)
 b) How tolerance charts are developed? Explain the general structure of tolerance chart. (5)
- Q.5 a) What do you understand by tolerance stacking? How stacking can be interpreted? Explain with the help of example. (5)
 b) Describe the advantages and limitations of combined operations while selecting and planning a manufacturing process. (5)
- Q.6 a) What are the factors which contribute to instability in a workpiece? State and explain advantages of good geometric control. (5)
 b) What are the criteria considered for selection of tools in a manufacturing unit? (5)
- Q.7 Prepare a process sheet with proper operation sequence, time estimation, and process picture, use of proper tooling and equipment for adapter ring. The number of components to be produced is 1500. (10)



COLLEGE OF ENGINEERING, PUNE.
(AN AUTONOMOUS INSTITUTE OF GOVT. OF MAHARASHTRA)

END SEMESTER EXAMINATION
(PE-304) METROLOGY AND QUALITY CONTROL

Programme: T. Y. B. TECH. (PRODUCTION S/W)

Year: 2011-12

Duration: 3 hr

Semester: **II**

Max. Marks: 50

Instructions:

1. All questions are compulsory.
2. All questions carry equal marks
3. Draw neat sketches wherever required.
4. Use of Non-programmable calculator is permitted

Q.1

Attempt any two:

- a) Explain the Two Wire method to measure the effective diameter of the screw thread. Also derive the relation for best wire size. 5
- b) State the different methods to measure the gear tooth thickness and explain any one of them. 5
- c) State different types of interferometers and explain any one. 5

Q.2

Attempt any two:

- a) Differentiate between Form Errors and Waviness. Explain the different mathematical methods to evaluate the surface roughness. 5
- b) Write a short note on following. 5
 - i. Tool makers microscope
 - ii. Co-ordinate Measuring Machine
- c) State the principles and applications of following instruments 5
 - i. Parkinson gear tester
 - ii. Limit gauges
 - iii. Optical flats
 - iv. Angle gauges
 - v. comparators

Q.3

Attempt any two:

- a) Explain the concept of chance variation. 1
In an automobile filling process 175 gms of certain chemical is to be packed in certain container. The permissible variation is ± 5 gms. To investigate the capability of the process, samples of 5 each were drawn from 10 successive batch size and data were recorded as given below. 4

Batch	1	2	3	4	5	6	7	8	9	10
Mean X bar	177	178	176	176	174	177	175	176	176	173
Range	3	6	3	8	2	8	6	7	3	2

Assuming that the process to be within control, establish the capability of the process and compare it with the given specifications. Take $d_2 = 2.326$ for $n = 5$

- b) State and explain the importance and applications of 7 QC tools in manufacturing 5
 - c) State the essential steps required to register for the ISO certifications and explain them briefly 5
- Q.4** a) Differentiate between the type I error and type II error. 2
 The number of defectives in a lot for a particular item is shown below. Each lot consist of 400 items. Plot the appropriate control chart and suggest the immediate actions. 3

Lot No.	1	2	3	4	5	6	7	8	9	10	11	12
No. of defectives per lot	24	38	52	26	36	30	42	52	20	16	20	24

- b) Explain concept of 'Quality Function Deployment' tool and state its importance. 5
- Q.5** a) In a double sampling 2% AOQL acceptance rectification plan: 5
 $n_1 = 32, c_1 = 0, n_2 = 38, c_2 = 2, N = 1000$
 Determine
 i. the probability of acceptance of a 2% defective lot.
 ii. the average total inspection.

Given:

np'	C=0	C=1	C=2
0.64	0.522	0.861	0.972
0.76	0.472	0.827	0.859

- b) Explain the DMAIC and DMADV project methodologies used in the six sigma environment. 5



COLLEGE OF ENGINEERING, PUNE-5

(An Autonomous Institute of Govt. of Maharashtra)

END Semester Exam

(IE 316) Industrial Automation

Programme: T. Y. B. Tech

Year: 2011-12

Duration: 3 hr

Semester II

Max. Marks: 50

Instructions:

1. Figures to right indicate full marks.
2. Draw neat diagrams wherever required.
3. All questions are compulsory.

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- Q.1 A** Explain the terms- **6**
- 1) Multidrop in HART Protocol
 - 2) Function Block in Foundation Fieldbus Protocol
 - 3) Rangeability
- B** What are the major problems associated with control valve? **4**
- Q.2 A** Explain ball valve with suitable application. **6**
- B** Viscous oil is transported through pipeline with a flow rate 1200Liters per hour. The temperature of a plant is varying continuously. Select and justify a control valve which can be used for above application. Suggest and explain an actuator for the selected control valve. **4**
- Q.3 A** Develop a ladder logic diagram for the application for sequencing of three machines. Sequence of events are as follows:(Use Seven step Logic) **6**
- 1) The expected sequences are 3-1-2.
 - 2) While starting the machine there should be at least a time delay of 2 min.
 - 3) Temperature environment is 40.
 - 4) Machine 1, 2, and 3 will remain on for 10, 20, 30 min. respectively.
 - 5) A master reset will stop all machines simultaneously.
- B** Explain input and output module of a PLC. **4**
- Q.4 A** Select all the required hardware of PLC system for the following application. **6**
- There are three ingredients from process line X, Y, Z for a reactor. Three mixers are required for mixing the three ingredients with a different speed..

After the process begins, mixer A is to start after 7 seconds elapse. Next, mixer B is to start 3.6 seconds after A. mixer C is to start 5 seconds after B. All then remain on until a master enable switch is turned off. All three inlet valve remain on for 5min to fill the reactor. The flow rate is fixed for all process lines. Alarm will be generated if flow rate is change. Draw a ladder diagram for the same.

- B** List different working parts of SCADA systems and explain their functionalities. **4**
- Q.5 A** What the elements of commercial distributed control system network? Mention its important four advantages. **6**
- B** What are higher level automation tools available in DCS system? Explain them in short. **4**

All the Best

College of Engineering Pune
(An Autonomous Institute of Govt. of Maharashtra)

END Semester Examination
(PE-306) Tool & Die Design

Programme: T.Y. B.Tech. (Production S/W)

Duration: 3 hrs.

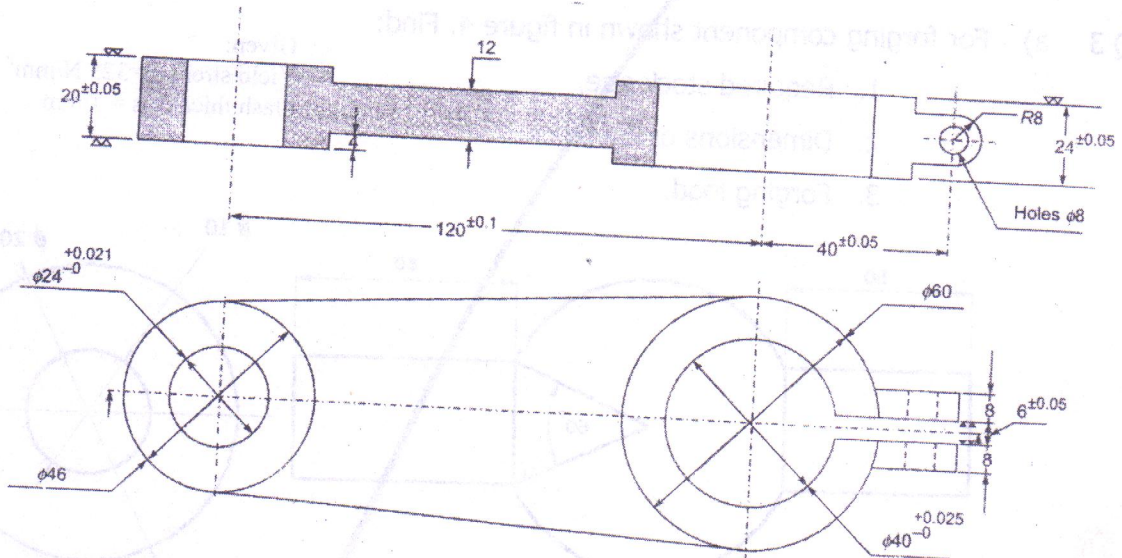
Year: 2011 - 12

Max. Marks: 50

Instructions:

- 1) All Questions are compulsory
- 2) Neat Diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.

Q 1 a) Design a drilling jig for drilling of holes of $\Phi 24$ mm for a component shown in Fig.1. **5**

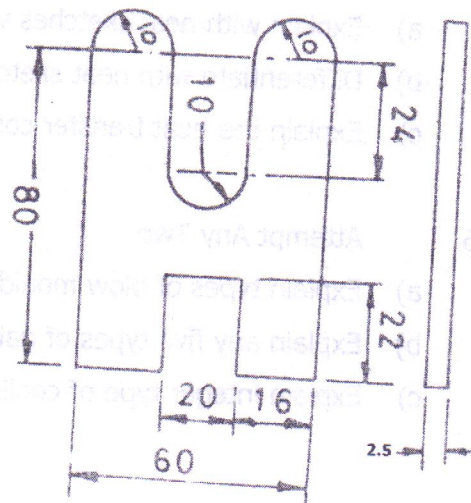


- b) What is fool-proofing in jig or fixture design? **2**
- c) Explain Equalising and wedge type of clamps with neat sketches. **3**

Q 2 a) Design Progressive die for the component shown in Fig. 2 having thickness 2.5 mm and ultimate shear strength 350 N/mm². Calculate

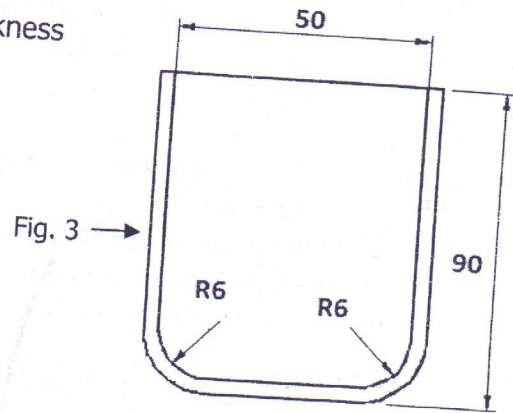
- (i) Press Capacity in Tonnes
- (ii) Center of pressure
- (iii) Die & Punch Dimension.

(All Dimensions are in mm)



b) Design a suitable drawing die for the component shown in Fig. 3, having thickness 2.4 mm and yield strength 360 N/mm².

- Calculate: (i) Percentage reduction ;
 (ii) No. of draw required;
 (iii) Blank size using area method;
 (iv) Drawing force and Press capacity
 (All Dimensions are in mm)



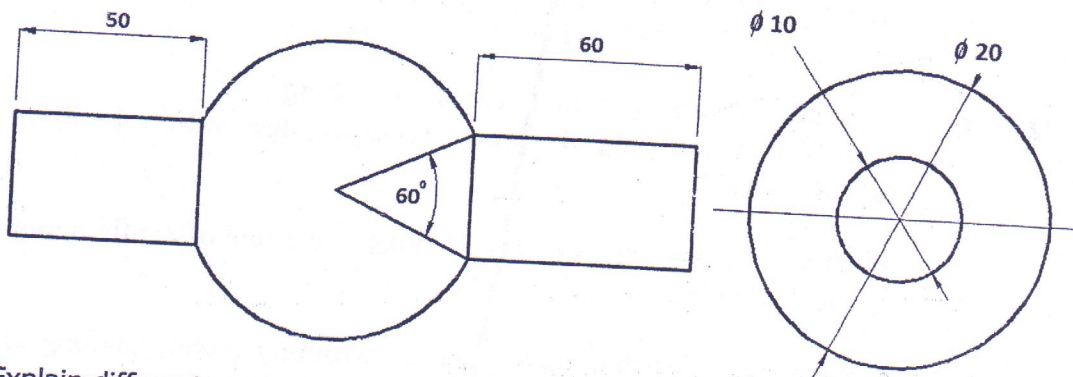
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Q 3 a) For forging component shown in figure 4. Find:

1. Required stock size,
2. Dimensions of die block
3. Forging load.

Given:
 Yield strength=325 N/mm²
 Flash thickness = 1 mm

5



b) Explain different operations performed in forging with suitable sketches.

5

Q 4 Attempt Any Two

- a) Explain with neat sketches various types of ejection system in die-casting.
- b) Differentiate with neat sketches Hot and Cold chamber die casting.
- c) Explain the heat transfer consideration in pressure die casting.

5

5

5

Q 5 Attempt Any Two

- a) Explain types of blow moulding with suitable sketches.
- b) Explain any five types of gates with suitable sketches used in plastic moulding.
- c) Explain integer type of cooling of cavity mould with neat sketches.

5

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College of Engineering, Pune-411005.
(An Autonomous Institute of Government of Maharashtra)
Department of Production Engineering and Workshop
END-SEMESTER EXAMINATION

Class : T. Y. B. Tech. Production S/W
Subject : INDUSTRIAL ENGINEERING [PE - 308]

Year : 2011-2012
Time : 3 Hours

Instructions:

1. Solve **any FIVE** questions.
2. Figures to the right indicate full marks.
3. Draw neat self-explanatory sketches wherever required.
4. Use of pocket calculators is allowed.

- Q.1 a) What is meant by 'Performance rating'? Explain 'Westing house system of rating'. 3
- b) Compare 'Time wage system' with 'Piece wage system'. (at least six points) 3
- c) Explain 'salary and wage administration process'. 4
- Q.2 a) Define 'Standard Time'. Explain process of calculating the same. 3
- b) 2500 observations were conducted and it was found that the activity under study occurred 1200 times; determine the limits of accuracy and limits of error. 3
- c) Explain the process of 'analytical estimating'. State its advantages and drawbacks. 4
- Q.3 a) Define 'Work measurement'. Discuss the objectives of the same. 3
- b) Explain the attributes of 'qualified and experienced worker'. 3
- c) Work sampling study was conducted for 200 hours in the machine shop in order to estimate the standard time. The total numbers of observations recorded were 3000. No working activity could be noticed for 500 observations. The ratio between manual and machine elements was 2:1. Average rating factor was estimated as 1.2 and the total numbers of articles produced during the study period were 6000. Rest and personal allowance is 12%. Estimate 'Standard Time'. 4
- Q.4 a) What is 'work sampling'? Explain process of 'work sampling'. 3
- b) Define 'personal management'. Explain characteristics of good personal policy. 3
- c) Using 'Taylor's differential piece rate plan', calculate the earnings of operators 'A' and 'B' for following data: 4
- 1) Output of Operator 'A': 650 Nos.
 - 2) Output of Operator 'B': 825 Nos.
 - 3) Standard Production: 100 Nos. per hour.

4) Labour hourly rate: Rs.8/-

5) Rate differential applied: 80% of std piece rate for below std.
120% of std piece rate for above std.

- Q.5 a) Explain different types of employment tests used by Personal department. 3
b) Define 'Job evaluation' and explain steps involved in it. 3
c) Using '50-50 Hasley Plan' and 'Rowan Plan' calculate wages of the operator for following data:

- 1) Hourly wage rate= Rs.20/-
2) Standard time to complete the job= 8 Hours. 4
3) Actual time taken to complete the job= 6 Hours.

- Q.6 a) Explain 'Management By Objective' (MBO). 3
b) Define 'Ergonomics' and explain objectives of the same. 3
c) In making a time study of a laboratory, technician performing an analysis of processed grain in a factory, the following times were noted for a particular operation.

Run	1	2	3	4	5	6	7	8	9	10	11	12
Operation time (sec.)	21	21	16	19	20	16	20	19	19	20	40	19
Run	13	14	15	16	17	18	19	20	21	22	23	24
Operation time (sec.)	21	18	23	19	15	18	18	19	21	20	20	19

If the technician's performance has been rated at 120 %, and the company policy for allowance (personal, fatigue, etc.) stipulates 13 %, 4

- Determine the normal time.
- Determine the standard time.

Watch readings falling 50 % above and 25 % below the average may be considered as abnormal.

END SEMESTER EXAMINATION

(PE – 304) KINEMATICS AND DYNAMICS OF MACHINES

Programme :- T. Y. B. Tech. (Production Sandwich)
Duration :- 4 Hrs.
Max. Marks :- 50

Date :- 11/05/2012
Year :- 2011 – 12
Semester :- II

Instructions:-

1. Attempt any five questions.
2. Figures to the right indicate full marks.
3. Draw neat sketches wherever required.
4. Use of non-programmable calculators is allowed.
5. Assume suitable data wherever necessary.

Q.1. (A) The turning moment curve for an engine is represented by the equation,
$$T = 20000 + 9500 \sin 2\theta - 5700 \cos 2\theta, \text{ N-m.} \quad (5)$$
where θ is the angle moved by the crank from inner dead centre.

If the resisting torque is constant, find:

- (i) Power developed by the engine
- (ii) Moment of inertia of flywheel in kg-m^2 , if the total fluctuation of speed is not to exceed 1% of mean speed which is 180 r.p.m; and
- (iii) Angular acceleration of the flywheel when the crank has turned through 45° from inner dead centre.

(B) Derive the fundamental equation for viscous flow through the rectangular slot. (5)

Following data is given for a hydrostatic step bearing:

- Supply pressure = 6 MPa
- Shaft speed = 750 rpm
- Viscosity of the lubricant = 30 cP
- Shaft diameter = 400 mm
- Recess diameter = 250 mm
- Lubricant flow rate = $230 \times 10^3 \text{ mm}^3/\text{s}$

Calculate the optimum film thickness for minimum power loss and the corresponding power loss.

Q.2. (A) Explain what is "direct and reverse crank method" and solve the following; (5)
A five-cylinder radial engine driven by a common crank has the cylinders spaced at 72° . The stroke is 200 mm, length of the connecting rod is 250 mm. The mass of the reciprocating parts per cylinder is 10 kg. Calculate the primary and secondary forces and couples at crankshaft speed of 1200 rpm.

(B) A worm transmitting 2.2 kW power at 1000 r.p.m. drives a worm gear rotating at 20 r.p.m. (5)
The pitch diameter of single start worm is 60 mm. The transverse pitch of the worm gear is 15.7 mm, while the normal pressure angle is 14.5° . Determine:

- (i) The components of tooth force acting on the worm and worm gear
- (ii) The efficiency of worm gear pair
- (iii) The power lost in friction
- (iv) Whether or not the drive is self-locking
- (v) The designation of worm gear pair

Use the following relation for coefficient of friction:
$$\mu = 0.0765/(V_s + 0.4)^{(1/2)}$$
 where, V_s = sliding velocity, m/s

- Q.3. (A)** Compare coulomb damping with viscous damping. In a free damped vibrating spring-mass system, mass is 2 kg and spring stiffness is 100 N/m. It is observed that the initial amplitude of 100 mm is reduced to 1 mm in 10 oscillations. Determine: (5)
- Logarithmic decrement
 - Damping factor
 - natural frequency of vibration and
 - damped frequency of vibration
 - Critical damping coefficient
 - Damping coefficient
- (B)** State the assumptions made while deriving Reynold's equation. With the help of plot of coefficient of friction Vs bearing characteristic number ($\mu N/p$ curve), explain the different regimes of hydrodynamic lubrication. (5)
- Q.4. (A)** (i) Why permissible bending stress for gear tooth is taken as one third of the ultimate tensile strength? (5)
- Why helical gears are preferred at higher speeds?
 - Why single plate clutches are dry type, whereas multi-plate clutches are wet type?
 - What are the two distinct applications of flywheel, based on supply of power from the source and requirement of the power? Give one example of each.
 - Explain clearly the terms 'static balancing' and 'dynamic balancing'. State the necessary conditions to achieve them.
- (B)** A ball bearing operates on a work cycle consisting of three parts: a radial load of 3000 N at 720 r.p.m. for 30% of the cycle, a radial load of 7000 N at 1440 r.p.m. for 40% of the cycle and a radial load of 5000 N at 900 r.p.m. for remaining part of the cycle. The dynamic load carrying capacity of the bearing is 16600 N. Calculate: (5)
- average speed of rotation
 - equivalent dynamic load and
 - rated life of the bearing in hours.
- Q.5. (A)** A straight bevel pinion having 18 teeth is to mesh with a straight bevel gear having 40 teeth. The axes of the pinion and the gear intersect at right angles. The pinion and gear are to be made of case hardened steel having ultimate tensile strengths of 720 N/mm² and 580 N/mm² respectively. The gear pair is to be manufactured by generation. The pinion shaft is connected to 15 kW, 1440 r.p.m. electric motor. The starting torque of the motor is approximately twice the rated torque. If the surface hardness of the gear pair is to be 350 BHN, design the gear pair with factor of safety of 1.5. Assume velocity factor accounts for the dynamic load. (5)
- $$Y = 0.484 - \frac{2.87}{Z}, \quad K = 0.16 \left(\frac{\text{BHN}}{100} \right)^2, \quad C_v = \frac{5.6}{5.6 + \sqrt{V}}$$
- The standard values of modules in mm are 1.0, 1.25, 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10, 12, 16, 20, 25, 32, 40 and 50.
- (B)** What are the methods to determine the equation of motion? Find the natural frequency of a simple pendulum by any one method. Neglect the mass of the rod. (3)
- (C)** Two identical ball bearings A and B are used in two different applications. The equivalent dynamic load on the bearing B is half of that on the bearing A. The remaining conditions are identical. What will be the expected life of bearing B as compared to the life of bearing A. (2)

- Q.6. (A) Write a short note on any one transmission type dynamometer. (5)
- (B) A helical compression spring of a cam-mechanism is subjected to an initial preload of 50 N. The maximum operating force during the load cycle is 150 N. The wire diameter is 3 mm, while the mean coil diameter is 18 mm. The spring is made of oil-hardened and tempered valve spring wire of Grade-VW ($S_{ut} = 1430 \text{ N/mm}^2$). Determine the factor of safety used in the design on the basis of fluctuating stresses. (Take $S'_{se} = 0.22 S_{ut}$ and $S_{sy} = 0.45 S_{ut}$) (5)
- Q.7. (A) Compare ball bearings with roller bearings. Define the following terms related to rolling contact bearings: (5)
- Static load carrying capacity
 - Equivalent Static Load
 - Dynamic Load carrying capacity
 - Equivalent Dynamic Load
- (B) A calliper disk brake is to be designed for the front wheels of sports car. The required braking capacity of each brake is 400 N-m. The inner and outer radii of the friction pads are 100 mm and 150 mm respectively. The coefficient of friction between the pads and rotating disk is 0.35, while the limiting intensity of pressure is 1 N/mm². Determine the required number of pads, if:
- The pads are annular segments with subtended angle of 60° per pad at the centre of the disk;
 - The pads are circular

COLLEGE OF ENGINEERING, PUNE-05

T.Y.B.TECH. END SEM EXAM

Subject Code: -- EE309

SUBJECT:-SWITCHGEAR AND PROTECTION

Date: - 06/05/2012

Academic year: 2011-12

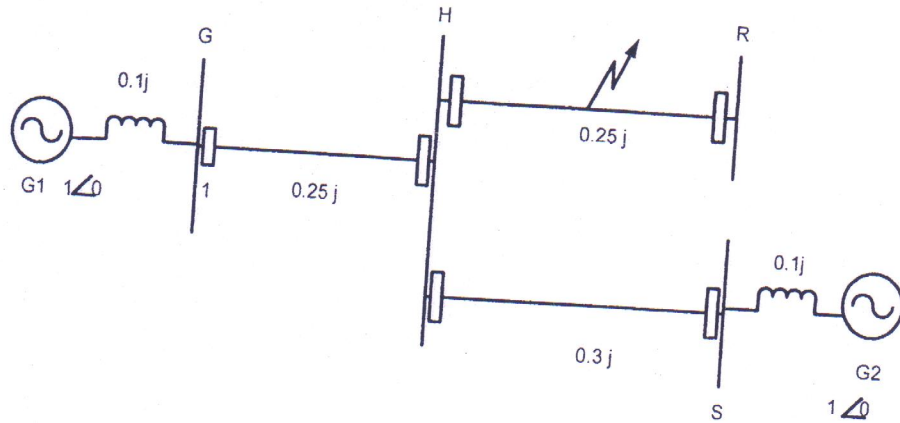
Time:-3 hrs

Max. Marks.-50

Instructions:-

1. Neat diagrams must be drawn wherever necessary.
2. Non programmable calculators are allowed.
3. Assume suitable data, if necessary.
4. Each question carries 5 marks.
5. Start answers of each question on new page.

- Q1. A 3-phase 200 KVA 11kV/400v transformer is connected in delta-star. The CTs on low voltage side have turns ratio of 500/5. Determine the CT ratio on high voltage side. Also obtain the current through the differential relay when an earth fault of 750 A occurs within the protective zone of transformer on the LV side. Assume balanced voltage.
- Q2. Explain the phenomenon of Loss of excitation related to an alternator and explain the protection provided against it. Draw suitable diagrams.
- Q3. Explain the effect of magnetizing inrush current of transformers on the protective system of transformers. Also explain the principle of harmonic restraint with the help of necessary schematic diagram.
- Q4. How do different distance relays perform with respect to their behavior on load, effect of arc resistance on the reach of the relay and response to power swing?
- Q5. An impedance relay at the breaker 1 position monitors the impedance of line GH. A three phase fault occurs at the **midway** point of line HR. The relay at breaker 1 is set for $Z_{GH} + 0.5 Z_{HR}$ for zone 2.
 1. Calculate the actual impedance seen by the relay.
 2. Will the relay at breaker 1 trip?
 3. How much of the line HR is the relay actually protecting?



- Q6. Write an algorithm to implement an overcurrent relay by using a microprocessor. Also draw the flow chart for the same.
- Q7. Why does a busbar differential scheme have a tendency to operate for external faults? How is the value of stabilizing resistance decided?
- Q8. In a 220 kV system, the reactance and capacitance upto the location of circuit breaker is 8 ohms and $0.025 \mu\text{F}$ respectively. A resistance of 600 ohms is connected across the contacts of the circuit breaker. Determine the following:
1. Natural frequency of oscillation
 2. Damped frequency of oscillation
 3. Critical value of resistance which will give no transient oscillation
 4. The values of resistances which will give damped frequency of oscillation at $\frac{1}{4}$ th of the natural frequency of oscillation.
- Q9. Write short notes on:
1. Insulation Coordination
 2. Resistance grounding
- Q10. Explain the concept of mimic impedance with relevant equations. What is its role? Compare various phasor estimation algorithms.
- OR**
- Q10. Draw the equivalent circuit of CCVT. What is the function of tuning inductor?